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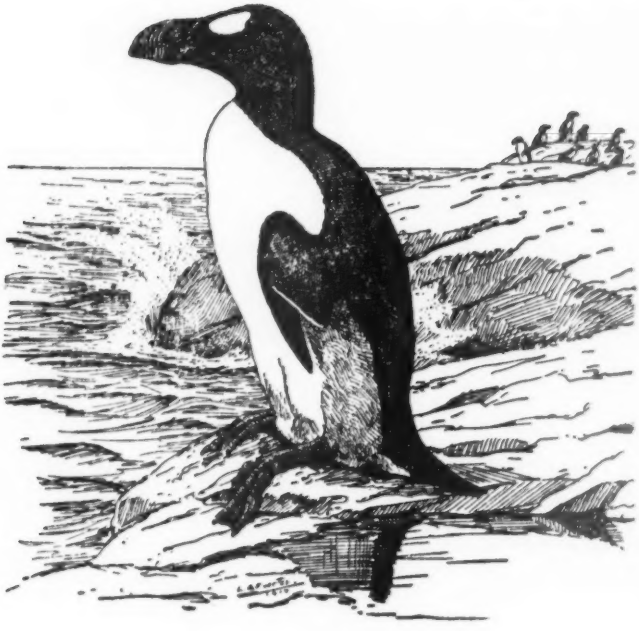

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LEACH'S PETREL (*Oceanodroma leucorhoa*) photographed by Robert C. Hermes at Machias Seal Island, Maine, in July of 1953. The exposure was made indoors, using a Speed Graphic camera and a wet-battery-operated Dormitzer, operating 2 lights at 200-watt capacity and 1/5000 second flash duration.

DOWNY YOUNG of LEACH'S PETREL, photographed at Machias Seal Island, August 1952, by Robert C. Hermes.

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THE STARVATION THEORY IN ALBATROSSES

BY L. E. RICHDALE

FROM November 1936 to September 1952, an annual study was made of the subspecies of Royal Albatross (*Diomedea epomophora sanfordi*) breeding at Taiaroa Head, Otago Peninsula, New Zealand. The breeding area overlooks the entrance to the Otago Harbour and is 20 miles by road from the city of Dunedin. A total of 22 breeding birds, 5 of which have disappeared, have been available for study in the 16 seasons involved. The birds are known intimately as individuals and are banded both with aluminium and celluloid bands. The first two fledglings reared, one in 1938 and the other in 1939, were watched in considerable detail. In 1938, I was on the breeding area on 118 days and in 1939, on 124 days. Particular attention was paid to the second half of the chick's period in the nest when it was alleged that the parents would desert the chick.

As far as is known, the subspecies at Taiaroa Head breeds only in two other places—the Forty-fours and the Sisters, islets of the Chatham group, which are approximately 600 miles east of New Zealand. A second subspecies, *Diomedea epomophora epomophora*, inhabits Campbell and Auckland islands which lie approximately 370 and 190 miles, respectively, to the south of New Zealand. There is possibly a third subspecies breeding in the interior of Tierra del Fuego (Murphy, 1936: 577).

Three major papers have been published on my observations at Taiaroa Head (1939: 467–488; 1942: 169–184, 253–264; and 1950: 1–92). Further, for the Campbell Island race, Sorensen (1950a: 1–39) has given an account of a five-year study on that island (1942 to 1946). He has also told us something of the Light-mantled Sooty Albatross, *Phoebetria palpebrata* (1950b: 1–30). The foregoing papers are vital in the discussion of the problem which is the main purpose of the present treatise. The term 'petrel' is used here to cover any species of the Procellariiformes.

For generations the view has been held in many quarters that the young of several kinds of seabirds such as gannets, penguins, and petrels are abandoned in the nest by their parents and are left for a relatively long period without food. The length of the period is seldom clearly stated, but the inference always is that the desertion period is not a normal inattentive period by the parents. The fledglings are said to subsist on a heavy store of fat, and it is only by fasting that the young birds can reduce their excessive nestling weight to flying weight. These ideas have had almost universal acceptance and, in fact, are still widely held. There have been dissidents in connection with albatrosses (Filhol, 1885: 44–50; Matthews, 1929: 567–568; Richdale, 1939: 483–488, and 1942a: 260–262), but even in 1951, so strong is the force of tradition, there is evidence that the findings of these workers have not been accepted (Rankin, 1951: 166–168).

INTERVAL BETWEEN BREEDING PERIODS

Up to the end of the 1950–51 season, I have been able to analyze 57 attempts made by Royal Albatrosses to breed at Taiaroa Head since 1935–36 and the effect of these attempts on the return or non-return of the birds in the following season. In all, 17 successful attempts have been made to rear chicks and, in every instance, the parents concerned failed to appear on the breeding area the following season. This suggests that the breeding interval lasts two years. For the Campbell Island Royal Albatross, Sorensen (1950a: 27–30) was able to watch the behavior of 13 mated pairs which succeeded in rearing chicks. Not one of these parents was seen on the breeding grounds in the following season. Sorensen concludes, "Breeding takes place every second year unless the egg or very young chick is lost."

Of the 40 mated pairs at Taiaroa Head which experienced nest failure, all returned to the breeding area in the following season. All but three of these 40 mated pairs bred again shortly after arrival. For Campbell Island, Sorensen observed the same pattern of behavior for birds experiencing nest failure.

The conclusion from the foregoing evidence is that in two races of Royal Albatrosses successful parents breed every second year and that, if nest failure is experienced, breeding usually occurs in the following season.

We do not have such precise data for the Wandering Albatross (*Diomedea exulans*). Matthews, who spent some time at South Georgia at the end of the nesting cycle of the Wandering Albatross,

makes the following significant statement (1929: 568): "The adult albatrosses do not breed every year, as they do not finish feeding their young until the new season's eggs are laid (by other birds) and incubation has started. Consequently, there must be an interval of at least one season between consecutive matings of any one bird."

Successful Royal Albatrosses at Taiaroa Head are on the breeding area occupied with reproductive duties for practically 12 months. For example, the mean pre-egg stage lasts 32.5 days, the mean incubation time is 79.27 days, and the mean period the chick is ashore is 236 days with a range from 216 to 252 days. Sorensen's work shows that a comparable pattern seems to be followed by the Campbell Island race. From the evidence available in the literature, it appears that the chick stage in the Wandering Albatross is longer than that in the Royal Albatross, being as long as 9 and 10 months. It would seem to me, therefore, that Matthews is correct in asserting that Wandering Albatrosses normally breed every two years.

HISTORY OF STARVATION THEORY TO 1938

The earliest reference that I have been able to find concerning the starvation theory is by Hutton (1865: 276–281) and is written from notes received from Mr. R. Harris who was a surgeon in the British Navy. Harris arrived at the Prince Edward Islands in September 1832, and apparently stayed until January 1833. He reached Kerguelen's Land at the end of January and apparently remained there until 6 December 1833. He made observations on the birds and passed information on to Hutton, who published the following concerning the Wandering Albatross.

> "At a certain time of the year, between February and June, Mr. Harris cannot exactly say when, the old birds leave their young, and go to sea, and do not return until the next October, when they arrive in large numbers. Each pair goes at once to its old nest; and, after a little fondling of the young one, who has remained on or near the nest the whole time, they turn it out, and prepare the nest for the next brood. . . . While the old birds are away, it is difficult to imagine how the young ones obtain food; for Mr. Harris assures me that no old birds are seen near the islands for months together. Strange as this may appear, its very strangeness is in favour of its truth, as no one would think of inventing such a story; and its correctness is further corroborated by the abundance of Albatrosses found at sea from April to October, inclusive, and their comparative rarity, especially of the old white ones, during the rest of the year which I believe to be the case."

Harris' statement that the old birds are absent for months and Hutton's statement that albatrosses are numerous at sea from April to October can, in the main, be explained. This is the period of the chick's last three quarters of its life as a nestling. As the chick begins

to develop, 'unemployed' albatrosses gradually leave the breeding grounds for that season, hence the impression that the breeding grounds have been deserted by *all* adults. This phenomenon has occurred at Taiaroa Head in each of the 16 seasons I have been working there. Further, Hadden has observed it on Midway Islands (1941: 213). That adult albatrosses are not numerous or are not noticed on the breeding grounds as the chicks begin to grow and, further, that they are more numerous at sea in that season is not proof that the chicks are being starved.

As a result of Hutton's article came a letter to *The Ibis* from Mr. C. J. Andersson of Cape Town, South Africa, dated 8 December 1865. Mr. Andersson wrote (1866: 324).

"I believe I have got a clue to the mystery about the young Albatross; I mean as to how they are supported during the absence of their parents, and while they are yet unable to fly. . . . I said one day to an intelligent master of a sealing-vessel, from whom I have obtained many valuable data about seafowl—'what do you know about the Albatrosses? how are the young, for instance, fed after being abandoned by their parents?' 'Why, of course,' was his prompt reply, 'they live *on their own fat*.' 'On their own fat!' I exclaimed; 'how do you prove that?' 'Because,' answered he, 'in the first place they are excessively fat at this season; secondly, they could not possibly in many instances get down to the water without being able to fly, and that they can't do'. . . . Perhaps you will smile at this; but if other animals, I would ask, can live for several consecutive months on their own fat, why not birds?"

In Andersson's letter we have the first mention that I have been able to find of young albatrosses living "on their own fat." The evidence, however, is hearsay with no quantitative data to support the assertions.

After several subsequent references to the starvation theory, for example, Buller (1888: 197) and Chapman (1891: 521), we come to a statement which, as far as I can ascertain, has been the major influence in perpetuating the belief of a starvation theory in albatrosses. It was published by Buller (1905: 131–133) who has taken the story from "The English Illustrated Magazine" in which appeared an article written by Mr. James Buckland. No date is given.

"The nestling is fed assiduously until it becomes so grossly fat that it exceeds a full-grown bird in weight. It is then deserted by its parents . . . . October has dawned before they return.

"And now I have arrived at the remarkable feature in the domestic economy of the wandering Albatross . . . a feature so extraordinary that the long list of natural-history wonders may be searched in vain for a parallel. How does the young bird receive food during the absence of its parents? *It does not receive any!* During the whole time—a period often longer than four months—it lives solely on its own fat! In this there is no assumption whatever. Naturally, the nestling is incapable of flight. . . . That being the case, the conclusion is incontrovertible."

The foregoing remarks by Buckland appear to refer to the young Wandering Albatross on the islands to the south of New Zealand, but could well be referable to the Royal Albatross on Campbell Island or to both species lumped together. Buckland's story, as quoted by Buller, gives the impression that he was on Auckland, Campbell, and Antipodes islands around the turn of the century. Presumably, he was a passenger on one of the Government steamers servicing the depots for castaways on those islands. At that time the two species had not been differentiated properly. Buckland's description of a fledgling, however, is that of a Wandering Albatross. Where Buckland acquired his amazing story of the starvation of the young albatross for fully four months is difficult to say. It closely resembles the published accounts of Hutton and Andersson already given. Like those accounts, Buckland gives no quantitative data on which the reader may form his own opinion.

For the Royal Albatross, the earlier accounts of the starvation theory in that species are really referable to the Wandering Albatross. For example, Buller (1905: 141) includes Harris' story, which applies to the Wandering Albatross, in his discussion of the Royal Albatross. Oliver (1930: 156) did not notice that fact and has stated for the Royal Albatross: "After a while the young is deserted by the parents and it must then undergo a period of fasting until it is able to fly." Murphy (1936: 581) then quotes Oliver and concludes, "it appears that this species has the same custom as the Wandering Albatross and other Procellariiformes with regard to abandonment of the well-grown nestling young."

The chief exponent of the starvation theory in the Royal Albatross as a direct result of what was happening at Taiaroa Head was R. A. Falla, Canterbury Museum, Christchurch, New Zealand. Audiences in Christchurch from the end of 1937 to well into 1938, listened to Falla's account of this amazing natural phenomenon. Others took up the theme and appropriate recitals appeared in the popular press. An example from *The Press* of Christchurch of 25 May 1938 follows: "Later on, when its [Royal Albatross chick] body feathers are well grown, but long before it can fly, its parents will give it a last feed and go away and leave it. By this time it will weigh about twice as much as an adult, and for a period of weeks, at any rate, it will have neither food nor drink, growing its feathers and wasting away until its weight is down to a level at which it can fly."

The foregoing résumé of the starvation theory in albatrosses represents majority opinion up to the time the first Royal Albatross chick was being reared at Taiaroa Head in 1938. There was, however,

a minority opinion also. On 10 September 1874, a French scientific expedition arrived at Campbell Island. Dr. Filhol, the naturalist, had become interested in the accounts of Harris, Hutton, and Andersson as already narrated. On 14 September, Filhol killed an albatross chick, found food in its stomach, and concluded that it was still being fed and was not subsisting on its fat (1885: 46). Then he decided to find out how the chicks were fed. Hutton had suggested that the chicks might go down to the sea at night for food and return in the morning. Filhol, however, pointed out that the chicks could not fly at that stage nor could they walk through the thick vegetation to the sea. Filhol then asked some sailors to maintain a continuous watch at several nests. Of the results he writes (p. 47):

"Trois jours après je fus informé qu'un vieil Albatros était près de l'un d'entre eux et qu'il lui dégorgeait de la nourriture. Je vérifai immédiatement ce fait, que je reconnus être exact, et nous eûmes souvent par la suite l'occasion de voir les parents venir auprès de leurs petits. . . . Ainsi la question relative à la manière dont etaient nourris les jeunes Albatros se trouvait être résolue de la façon la plus simple pour l'époque à laquelle nous étions à Campbell."

Therefore, as long ago as 17 September 1874, and only some nine years after Hutton and Andersson had published their stories, the starvation theory in albatrosses was repudiated. Subsequent writers have either overlooked or ignored Filhol's observations. The fledglings watched by Filhol would have been about three or four weeks from flying. Another point has to be mentioned. Although Filhol believed he had been watching the Wandering Albatross, he was really investigating the Royal Albatross which is the chief species breeding on Campbell Island. Harris, Hutton, and Andersson, however, were discussing the Wandering Albatross, but I am not sure, as stated farther back, which species Buckland was discussing.

The next rebuttal came from Matthews (1929: 567–568), who was discussing the Wandering Albatross at South Georgia. He remarks, "When the down is shed the parents desert the young, which . . . haunt the old neighbourhood for some days." Then he continues, "The adult albatrosses . . . do not finish feeding their young until after the new season's eggs are laid (by other birds)." Little notice was taken of Matthews' conclusions, which, presumably, he had made from personal experience. It is a pity, however, that he has not recorded in print more details of his observations.

THE ROYAL ALBATROSS AT TAIAROA HEAD

In the first half of May each year, Royal Albatross chicks at Taiaroa head become 100 days old and they are still completely covered with white down (Richdale, 1939: fig. 9). At this stage, the young birds

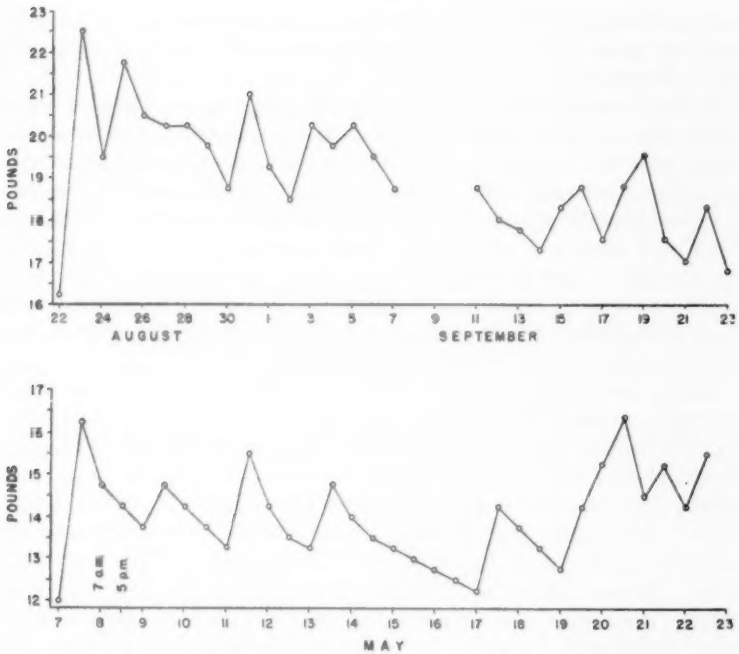

FIGURE 1 (above). Daily weights, taken at 6 p.m., of the 1938 Royal Albatross chick's last 33 days as a nestling.

FIGURE 2 (below). Daily weights taken at 7 a.m. and 5 p.m., of the same chick, in the watch period in May.

have somewhat more than 4 months to remain at the nest. The starvation theory suggests that the end of this 100-day period is approximately the age at which albatross chicks are deserted by their parents and subsist for the remaining period at the nest on their own fat.

A reference to figure 2, which gives gives the weights, taken twice daily, of the 1938 chick for 16 days from 7 May to 22 May, would show that the chick lost weight when not fed. Further, the chick was left unfed for four and one quarter days from 13 May to 17 May during which time its weight fell steadily from 14¾ to 12¼ lb. Counting from 17 May, the chick still had 131 days to live on the breeding area. Just what would have happened to this chick if the parents had ceased to feed it? This chick ultimately reached a peak weight of 22½ lb. when 199 days old, and it weighed approximately 16 lb.

when it flew at 231 days of age. Also, at 100 days of age, the middle toe and claw, tarsus, bill, and wing were still growing (Richdale, 1939: 486–487).

Figure 1 gives the daily weights, taken at 6 p.m., of the 1938 chick for its last 33 days ashore. In that period, the chick was known to have been fed at least 14 times, but in spite of receiving food there was a gradual decline in weight. It may be observed that on one occasion from 23 August to 26 August inclusive, the chick was fed on each of 4 consecutive days yet, when weighed at 6 p.m., it showed no advance. Weekly weights for the same period taken of the 1939 chick at Taiaroa Head and for two individual chicks at Campbell Island (Sorensen, 1950a: 35) show the same phenomenon of falling weight whilst the chicks were still being fed.

In my first albatross paper (1939: 484–485), I have given in detail the visits of the 1938 parents to their chick from 7 May to 24 September which is two days after the chick flew. Actually, for the second 100 days that the 1938 chick was at the nest, it was fed on 79 per cent of the days and for its final 31 days it was fed on 55 per cent of the days. From when the chick was left unguarded by its parents at the age of 42 days until it was 100 days old, it was fed on 48 per cent of the days. Instead of being deserted at the end of the first 100 days when the feathers were beginning to grow rapidly, the chick was fed more frequently. Around 200 days of age, when the feathers had completed their rapid growth and when the bill, tarsus, and toe had attained maximum growth (Richdale, 1939: 486–487), the parents then reverted to less frequent visits.

At 6:30 a.m. on 17 September 1938, I was fortunate enough to witness and photograph (1939: fig. 12) the second last meal ashore received by the first chick reared at Taiaroa Head. Three days later, a nearby resident saw the last meal ashore being given, evidence which I corroborated by actually weighing the chick (see figure 1). The chick flew on 22 September. Somewhat the same situation obtained with the 1939 chick. By the device of daily weighing, it was found that the second chick was fed twice on 23 September and again on 24 September. Its weight rose from 21½ lb. at 9:30 a.m. on 22 September, to 25¼ lb. at 8:30 a.m. on 24 September. Then the weight dropped to 22 lb. at 6 p.m. on 26 September. The chick flew some time on 27 September.

Five other fledglings mentioned in table 1 followed the same pattern as the first two. One of these five later chicks (1942b) was observed being fed at 11 a.m. on 29 September and was found to have flown some time before 8 a.m. on 30 September, which means that it flew

at some period within 21 hours of being fed. The time of the last observed meal ashore given to the last five fledglings noted in table 1 may not have been the last one. An additional meal may have been given unnoticed, and this applies particularly to the 1941 and 1950 chicks. Further, records for the last five chicks, noted in the table, were all made by sight, as the device of weighing was not used. The foregoing information, involving seven fledglings, should be sufficient to show that Royal Albatross chicks at Taiaroa Head are fed to the end; there is no starvation period.

TABLE 1

RELATION OF OBSERVED LAST MEAL ASHORE TO DEPARTURE OF ROYAL ALBATROSS FLEDGLINGS AT TAIAROA HEAD

Chick	*Time of last known meal ashore*	*Time of departure*	*Days ashore*
1938	8:30 a.m., 20 September	Between 5 p.m. and 6 p.m., 22 September	231
1939	24 September	27 September	243
1941	11 a.m., 2 October	7 October	251
1942 (a)	28 September	2:30 p.m., 30 September	247
1942 (b)	11 a.m., 29 September	before 8 a.m., 30 September	246
1945	11 October	5 p.m., 13 October	252
1950	5 p.m., 10 September	14 September	232

Further evidence is available. More recently, and since I made my discoveries, Sorensen (1950a: 24 and Table IV) has found that Royal Albatross chicks on Campbell Island do not undergo a starvation period. Sorensen remarks, "The theory propounded by some early writers that chicks are deserted by the parents, and have to undergo a period of fasting before they can fly, has no foundation in fact." Sorensen made weekly weighings of several chicks from hatching to departure, so that his views are based on his own quantitative data.

An interesting point which has not yet been definitely proved is that a parent may arrive at the nest after the chick has flown. The mother of the 1938 chick was said to have been observed sitting on the nest at 1:30 p.m. on 24 September. This visit was approximately 44 hours after the chick had flown and 4 days 5 hours after it was last observed being fed. The female was not observed by me but by a nearby resident, who saw the bird rise and fly off. It would seem that the chick departed in an inattentive period by the parent and had the chick stayed longer the parents would presumably have continued to visit it.

As for the 1939 chick, which I found missing at 10 p.m. on 27 September, it also appeared to have departed in an inattentive period. The night of 27 September was a clear, moonlight night, so that I could not have missed the chick, if present. Moreover, on returning to the breeding area at 7 a.m. next day, I again failed to find the chick. At 9 a.m., a nearby resident saw the 'chick' at the nest, but did not check the bands as he was unaware that the real chick had flown. The resident's 'chick' was obviously one of the parents. The possibility that the bird was another adult is ruled out, because at this date (28 September) no adults, other than parents feeding chicks, had ever been observed on the breeding area in my many years of watching. Further, in 1939, the only parents using the breeding area were those of the chick under discussion. For Campbell Island, Sorensen (1950a: 24) states, "Frequently, too, parent birds have been noted to visit the nest after the departure of the chick." Unfortunately, Sorensen gives no evidence in support of his statement that parents return to the nest after the chicks have flown.

In summary, by direct observation supported by the weighing of the chicks, Royal Albatross fledglings at Taiaroa Head are fed to the end of their fledgling period and appear to fly in a normal span of inattention by the parents. The same situation obtains at Campbell Island as recorded by Filhol (1885: 46) and Sorensen (1950: 24 and Table IV). In the second 100 days of life, fledglings may be fed on 79 per cent of the days, but the visits may drop to 55 per cent for the remaining 30 days or so.

EVENTS SINCE 1938

When it was realized that the 1938 Royal Albatross chick was fed to the last, it was argued that the starvation theory still applied to the Wandering Albatross. Early in November 1950, a party of New Zealanders was on Antipodes Island some 400 miles southeast of New Zealand. While there they saw Wandering Albatross fledglings around 8 months old being fed by adults. Mr. Turbott of the Auckland Museum, New Zealand, wrote as follows in the *Auckland Weekly News* of 24 January 1951.

> "It was long believed that albatross chicks were deserted by their parents during their last few months on the nest, although the study of the royal albatross has shown that this was an error. On several days we were to see well-grown chicks receiving their meal, indeed it was an attraction of any visit to the 'tops' that without warning a near-by chick might be fed."

The chicks which Turbott saw being fed would have had at least 4 weeks if not 6 weeks to go before flying. His observations merely show that the chicks had not been subsisting "on their fat" since

'June' and not that they would continue to be fed to the end of their nestling life. All the same, I find it difficult to believe that there is any difference in feeding habits between the chicks of the Wandering and Royal albatrosses at this late stage. I would suggest, therefore, that the thesis of a starvation period in the Wandering Albatross is as invalid as it is for the Royal Albatross.

It is now necessary to discuss a recent supporter of the starvation theory in the Wandering Albatross (Rankin, 1951: 166–168). Rankin was at South Georgia in the 1946–47 season and made his last visit to the albatrosses before the parents had ceased to guard their chick continuously, so that he had no opportunity to test out the theory at first hand. Rankin writes as follows concerning the alleged abandoning of the young by the parents.

> "That they do so is certain because of observations made on other albatross at Tristan da Cunha and elsewhere, and it is also a common habit with many of the Tubinares and other sea-birds. If a nestling continued to be fed by its parents it would be content to remain indefinitely at the nest, happy and carefree, with no inducement to go out into the wide world. Drastic and cruel as it may seem, it is only by cutting off supplies and completely abandoning the young bird that it is compelled to fend for itself. . . .
>
> "Somewhere around that time [June] or even in July the moment comes when the parents abandon it and then for another four months the youngster will remain alone in the nest, existing on the reserves built up in its body. . . .
>
> "By finishing with their family cares in June or July the parents have a clear four or five months before the beginning of the next breeding season, so *it is possible for them to reproduce every year.*" [Italics mine.]

If Rankin's statements are true then the Wandering Albatrosses at South Georgia behave very differently from those on Antipodes Island. It seems to me that this writer has allowed himself to be influenced far too much by the literature. His own words show that he realizes "there has been some controversy" (p. 166).

Finally, there is the work of Sorensen (1950a: 19, 28–30) who weighed two Campbell Island Light-mantled Sooty Albatross chicks weekly from hatching to the week before departure. His observations point to the absence of a starvation period and that the chicks flew in an inattentive period by the parents. At the end of the third last week at the nest, one chick weighed 6 lb. 7 oz. and the other 7 lb. 11 oz. At the end of the second last week, the figures were 7 lb. 3 oz. and 7 lb. 13 oz. respectively, showing clearly that the chicks had been fed. The next week the chicks had flown. A graph (p. 19) illustrates that feeding continued at least until the chicks were last weighed.

REASONS FOR STARVATION THEORY

In conclusion, it may be well to attempt an examination of the causes which may have contributed to the birth of the starvation theory and then secondly to its ready acceptance in spite of a dearth of quantitative data in its support. I feel that if a member of each main group of the whole petrel family had been studied in the same detail as has been the case with the American Song Sparrow, *Melospiza melodia euphonia* (Nice, 1937 and 1943) and the English Robin, *Erithacus rubecula melophilus* (Lack, 1939, 1940, and 1943) the starvation theory would have been stillborn and perhaps not even conceived. As it is the starvation theory entered the world when practically nothing was known of the breeding biology of petrels. All that was available were casual observations recorded from hurried visits by people, scientific and otherwise, to petrel habitats. These observations, by scientific and lay people alike, were unconsciously influenced by preconceived ideas developed from watching or reading about birds in their home lands. Petrels were made to fit in with these ideas; the net result was inaccuracy. We still know very little about the petrel family. Much more intensive field study is required before all the erroneous ideas, still too prevalent, can be eradicated.

'Unemployed' birds in the several species of petrels which I have studied gradually leave the breeding area for any given season as the chicks begin to grow. The breeding area then appears deserted. This feature impressed me very much on a recent visit (1952) to Whero Island where I was studying the final two months of the nestling stage of the Sooty Shearwater (*Puffinus griseus*). On examining several hundred burrows in the daytime not a single adult bird was found. At night scarcely any adults seemed to come in. All this was in great contrast to the intense activity of earlier months. Yet, the chicks were being fed. The position on the albatross breeding area is much the same. The 'unemployed' birds gradually leave as the chicks grow and the parents spend little time ashore. For this reason, unknown to early observers, there was a tendency to assume that the albatross chicks had been deserted.

It was known by early writers that petrel chicks became very fat, so that they were heavier than their parents. For some reason, which I cannot trace, it was assumed that these chicks could not reduce their weight unless they were starved, but no statistics were forthcoming to prove the assumption. A glance at figure 1 will show that the 1938 Royal Albatross chick at Taiaroa Head reached its peak weight on 21 August and while still being fed gradually lost weight until it flew on 22 September. Comparable results were

obtained for the 1939 chick. Sorensen's data for the Campbell Island Royal Albatross (1950a: 37) and for the Light-mantled Sooty Albatross (1950b: 19) support my findings. Elsewhere (1942a: 172, 261), I have shown how a Diving Petrel chick (*Pelecanoides urinatrix*) in its last 23 days in the burrow fell in weight from just over 180 grams to less than 120 grams. In all that time it missed a meal on only one night (11 nights before leaving), and I actually saw it being fed on the night it left the burrow. These examples show that nestling petrels can drop weight without having to fast.

A third factor which has led to thinking on an insecure foundation has been assumption that the large albatrosses breed each year. It was known that fledglings tended to be present when adult birds returned to prepare for the new breeding season. Further, it was assumed that no bird could begin breeding again while still attending a chick. Here was a dilemma from which the starvation theory allowed convenient escape. If the chicks could be starved for 4 months or so, the parents could secure the necessary rest. It all sounded so plausible. Matthews (1929: 568), however, was the first observer who suggested that the birds nested once in every two years. From my own evidence already given, I have shown that if successful in rearing a chick, Taiaroa Head Royal Albatrosses breed every two years. Sorensen (1950a: 19) has found this true for the Campbell Island birds. As far as I know, we have yet no proof, on a study of marked birds, that Wandering Albatrosses successful in rearing a chick breed every year. This species, however, is longer attending its chick than is the Royal Albatross, so that I would be very surprised if it were found to breed annually.

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SUMMARY

Because the behavior of 'unemployed' petrels on the breeding area as the chicks began to grow was not understood, because it was assumed that petrel nestlings had to fast to acquire flying weight, and because the large albatrosses were thought to breed annually, the idea of a starvation theory arose. These assumptions held sway because of a lack of detailed research in petrel habitats. The starvation theory does not apply to the Royal Albatrosses either at Taiaroa Head or at Campbell Island. I would suggest also that, in spite of contrary opinion, it does not apply to the Wandering Albatross either at Antipodes Island or South Georgia. From Sorensen's observations, Light-mantled Sooty Albatross chicks are fed for the full term of their nestling life.

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COLD RESISTANCE IN THE YOUNG RING-NECKED PHEASANT

BY FRED A. RYSER[1] AND PETER R. MORRISON

COLD resistance in many homoiothermic animals is not fully developed at birth, even though life after birth often entails resistance to low environmental temperatures. Because of less frequent utilization of sheltered burrows and dens for nesting, this problem would appear to be more acute in birds than in mammals. Some birds are further developed at hatching than others, and thereafter use no shelter beyond that afforded by the brooding hen. In northern United States the Ring-necked Pheasant is one of the most successful of these precocial species. In addition it is one of our most valuable game birds, and each year considerable resources are devoted to its propagation and management. Therefore a characterization of the development of cold resistance in this precocial species may well be of practical value in shedding light upon a possible mortality factor of early life.

MATERIALS AND METHODS

The young Ring-necked Pheasants were obtained from the Wisconsin Conservation Department through the agency of Mr. Fred Greeley of the Department of Zoology and were part of a larger group under study by the two departments. Though the principal ancestral stocks of these birds were *Phasianus colchicus torquatus* and *Phasianus c. colchicus*, *Phasianus c. mongolicus* and *Phasianus c. formosanus* also have been introduced into the game farm breeding stock. In all, 27 chicks from one hatch in 1949 and 38 chicks from five different aged hatches in 1950 were used. They were housed at brooder temperatures of 38 to 40° C., although slightly cooler thermal environments were available towards the periphery of the brooder. They were supplied with a continual source of drinking water and with game farm mash.

Body temperatures were measured with a Cambridge thread recorder utilizing thermocouples of copper-constantan inserted cloacally to a depth of 3.5 cm. Two measurements were made: one immediately after removal from the brooder and another following a timed exposure in a chamber immersed in a regulated cold bath. This exposure chamber afforded the chick just sufficient room to avoid contact with its walls. All measurements were made during the daytime when the chicks were normally active.

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BODY TEMPERATURES IN THE BROODER

Results.—Though the young pheasants lived in a hot thermal environment (38–40° C.), their body temperature was lower than that of adults. In figure 1 the average body temperature of young in the brooder is shown as a function of age. The body temperature of the 1949 hatch rose from about 39° on the 2nd day of life to 42° C. on the 13th day. During this time its standard deviation ranged from 0.49° to 1.14°, averaging 0.66° (figure 2). Again in the 5 hatches from 1950, the average body temperature rose with age to a level over 42°. During this time, its standard deviation ranged from 0.13° to 0.93°, averaging 0.57° (figure 1). The 1950 curve lies above that of 1949, and its individual averages do not describe nearly as regular a rise as those of the 1949 data, although a smooth curve can be easily drawn through the initial points of its 5 different hatches.

Discussion.—The body temperature level in adult pheasants lies between 42° and 43° C. Bennett (cited by Gerstell and Long, 1939) found an average body temperature of 43.0° in 70 pheasants in December, and an average of 42.5° in 60 birds in February. Fronda (1921) lists an average temperature of 42.5° for pheasants. Löer (1910) studying a number of species of pheasants, including the Ring-necked, gave an average of 42.44° ($\sigma = 0.55°$) for 22 birds of less than 1 year in age and 42.61° ($\sigma = 0.59°$) for 23 birds of from 2 to 4 years of age.

While in the brooder, the young pheasant is not under cold stress, for the temperature is only 2 to 5° lower than the adult body temperature. The brooder temperature would appear to lie within the range of thermic neutrality, for thermic neutrality in the 4 to 14 day old chicken, another gallinaceous species, has been shown to be around 35° (Barott and Pringle, 1946). While living in the brooder, the temperature of the pheasant chicks is only slightly more variable than that of the adults: $\sigma = 0.66°$ and 0.57° compared to 0.55° and 0.59°. Hence the slow rise in body temperature is not a matter of developing a capacity for regulation, but rather a gradual rise in the regulated temperature level.

Lamoreux and Hutt (1939), Scholes and Hutt (1942), and Randall (1943) have described this same gradual rise in the body temperature of the chicken, another precocial species. Scholes and Hutt brooded their chickens at 30.5°, 32°, 34°, 35°, 38° and 40° C. and discovered that the body temperatures at the higher brooder temperatures lay slightly above those at the lower brooder temperatures. But the differences in body temperatures were only 0.5 to 1.3° as compared

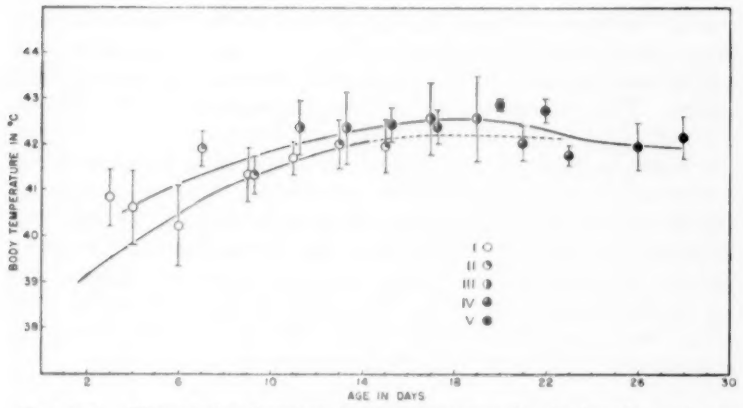

FIGURE 1. The relation between body temperature in the brooder and age. Circles show average values and bars show standard deviations for 6 to 10 individual measurements on 5 hatches of different ages in 1950. Top, average curve for 1950; bottom, average curve for 1949.

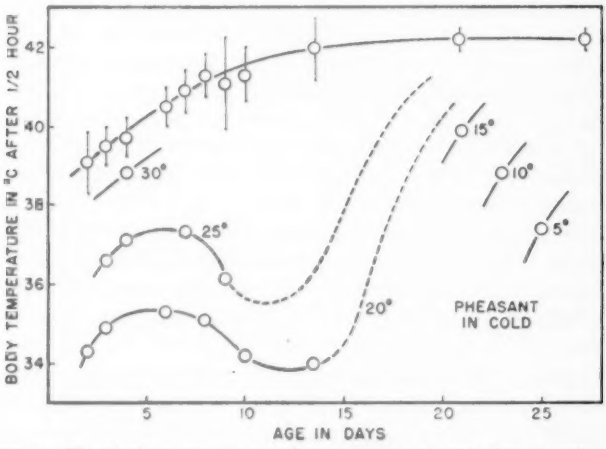

FIGURE 2. The body temperature after exposure to cold for 30 minutes as a function of age; 1949 results. Each circle shows the average value for 10 individual measurements. Ambient temperature is printed beside each curve. Top curve represents the body temperature of the chicks in the brooder. (Dotted lines are extrapolations.)

to a 9.5° difference between the highest and lowest brooder temperatures. At brooder temperatures of 38 to 40°, they noted an increase in body temperature of 1.5° (39.8 to 41.3°) between the ages of 2 and 9 days. This compares with an average increase of 1.6° (39.9 to 41.5°) observed in the pheasant (figure 1).

It would be expected that similar or even greater increases would be observed in altricial species, but only limited data are available on a single species, the House Wren (*Troglodytes aëdon*). In this form Kendeigh and Baldwin (1928) found that during the nestling period the body temperature of the young wren rose higher and higher above that of the incubator (*ca.* 38°). The body temperature of the 12 to 15 day wren was still 1.2 to 3.4° below that of the adult at ambient temperatures of 38 to 41° (Kendeigh, 1939).

EXPOSURE TO COLD

Development of cold resistance.—Figure 2 traces the effect of repeated exposure to cold upon the development of cold resistance in chicks of the 1949 hatch. It can be seen that exposure of only 30 minutes to mild ambient temperatures of 20 to 25° C. resulted in considerable losses of body temperature in the young chicks. The severity of the loss was related to the severity of the exposure, for the body temperature curve during exposure at 20° lies slightly below that at 25°. During 30-minute exposures to a temperature of 20°, the 2- to 4-day-old chick dropped 3 to 5°, the 6- to 7-day-old chick dropped almost as much, and the 8- to 13-day-old chick dropped 7 to 8°. These chicks were rested for eight days and then tested again, and their regulatory success was much better. But even on the twenty-fifth day, exposure at 5° resulted in a drop of more than 4° in body temperature. Therefore repeated 30-minute exposures to ambient temperatures of 20 to 25°, even though spaced at least one day apart, not only retarded the development of cold resistance, but actually set it back.

By employing five different hatches in 1950 it was possible to expose simultaneously chicks of 3, 7, 11, 15, and 20 days of initial age, in order to study the effect of repeated cold exposure upon different age classes. Figure 3 traces the effect of repeated cold exposure upon the five hatches from 1950 and shows the 1949 results for comparison.

The 3-day-old chicks from Hatch 1 were divided into two groups, so that both a light and a heavy exposure schedule could be employed. The results from the chicks on the heavier exposure schedule paralleled those obtained on the 1949 chicks. With each repeated exposure

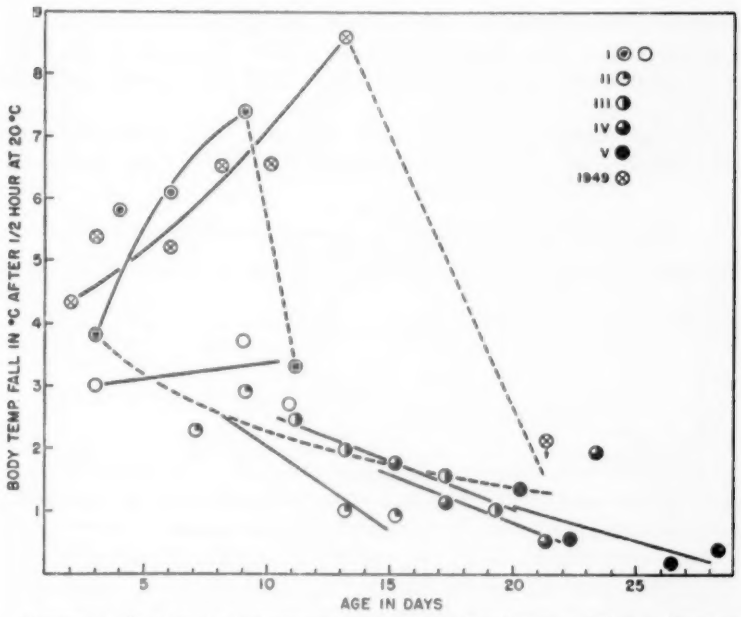

FIGURE 3. The loss in body temperature after 30 minutes at 20° as a function of age. Crossed circles, 1949 hatch; other circles, 1950 hatches. Each circle represents an average of 6 to 10 measurements (except for Hatch 1 in 1950, see table 2). Solid curves show trends within each hatch. The heavy broken curve represents the initial measurements made on each group; i.e., values uncomplicated by previous experimental treatment.

to cold, their cold resistance became progressively poorer, and only one of four chicks lived beyond nine days of age. The chicks on the lighter exposure schedule were not as drastically affected. Although cold resistance had only slightly improved by the eleventh day of age, they did not undergo the same progressive weakening in cold resistance as did both the first group and the 1949 chicks, and four of five chicks lived beyond the ninth day of life.

If the chicks were at least seven days old when initially exposed, no deleterious effects were evident. Indeed, in these older chicks previous cold exposure actually improved their resistance. This is illustrated in figure 3 in which the lines for individual hatches have much steeper slopes, showing faster improvement than the overall curve for all groups without previous cold exposure.

Figure 4 shows the same experimental results as figure 3, but in this case the development of cold resistance is correlated with body

weight. This correlation appears to be slightly better than the one with age, and a body weight of approximately 30 grams at the time of initial exposure would appear to be critical for repeated cold exposure.

Effect on mortality.—During both 1949 and 1950, there was considerable mortality among the experimental chicks. Table 1 presents

TABLE 1

MORTALITY DURING REPEATED COLD EXPOSURE (30 MINUTES AT 20° C.) IN 5 HATCHES FROM 1950

Hatch	*Initial age in days*	*Number of Chicks*	*Mortality*	
			Number	*Per cent*
1	3	10	5	50
2	7	7	1	14
3	11	6	0	0
4	15	6	0	0
5	20	6	0	0

the mortality data on the five age classes of 1950. Mortality dropped from 50 per cent in the three-day class, to 14 per cent in the seven-day class, and finally to zero in the three older classes.

Table 2 presents a breakdown of the temperature losses and mortality that occurred among the ten chicks of Hatch 1, which were initially exposed when three days old.

During the initial exposure Chick 5 suffered the greatest drop in body temperature and subsequently died.

Chicks 1, 2, 8, and 9 were subjected to the heaviest exposure schedule. During repeated cold exposures they showed considerable losses of body temperature (4.5 to 7.8°), and only 9 lived to be eleven days old. The survival of 9 is of interest in that it showed progressively poorer cold resistance up to 9 days, like 1, 2, and 8, but then suddenly improved.

TABLE 2

BODY TEMPERATURE LOSSES IN HATCH 1, 1950. (AFTER 30 MINUTES AT 20° C.)

Chicks	*3 Days*	*4 Days*	*6 Days*	*7 Days*	*9 Days*	*10 Days*	*11 Days*
5	6.4°	dead					
1	2.7	6.0°	5.9°		7.7°	dead	
2	5.1	5.0	5.9	dead			
8	5.1	7.8	7.8	dead			
9	2.4	4.5	4.7		7.0		3.3°
6	2.6		3.1		2.2		2.7
3	3.1				3.8		2.7
4	2.1				2.8		1.8
7	2.7				4.0		dead
10	4.6				5.7		3.6

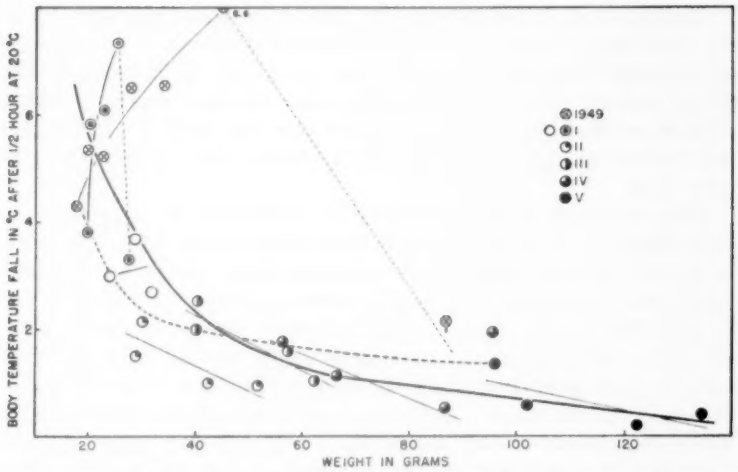

FIGURE 4. The loss in body temperature after 30 minutes at 20° as a function of body weight. Heavy curve shows average trend for all hatches. Crossed circles, 1949 hatch, and other circles, 1950 hatches. Each circle represents an average of 6 to 10 measurements (except for hatch 1 in 1950, see table 2). Solid curves show trends within each hatch. The heavy broken curve represents the initial measurements made on each group; i.e., values uncomplicated by previous experimental treatment.

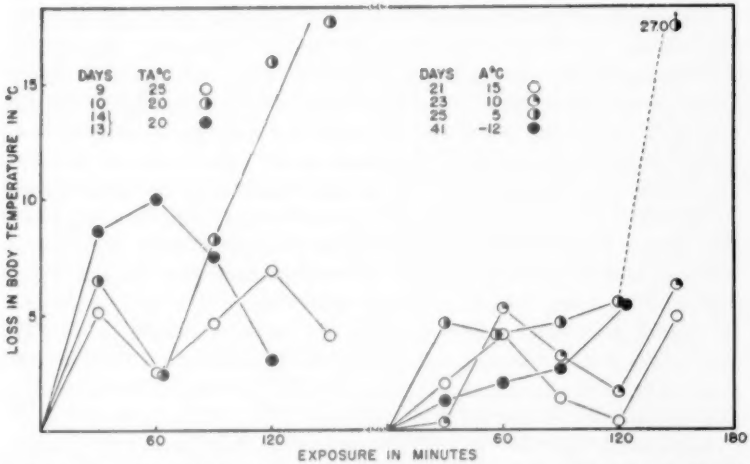

FIGURE 5. The relation between loss in body temperature and length of cold exposure in individual chicks. Various ages and ambient temperatures as indicated.

Chicks 6, 3, 4, 7, and 10 were subjected to a lighter exposure schedule, and only 7 died. Chick 10 survived although it experienced considerable temperature losses (4.6 to 5.7°). Even though this group suffered fewer fatalities, the early exposure certainly had a deleterious effect, for at eleven days of age, one chick (6) had poorer and 3 chicks (3, 4 and 10) only slightly better cold resistance than at three days.

Effect on length of exposure.—Figure 5 presents the results on the older chicks (9 to 41 days) which were exposed both for longer durations and to lower ambient temperatures than the younger chicks. There was no simple relationship between length of exposure and drop in body temperature. Even when a prolonged exposure resulted in a large drop, as in the case of the ten-day-old chick at 20° C. and the 25-day-old chick at 5°, the body temperature either fluctuated or leveled off for some time before it made a final precipitous drop. These fluctuations in body temperature were probably associated with changes in muscular activity of the chick within the exposure chamber.

Effect of growth.—Body weight was the only measurement of growth followed in the developing chicks. In 1950 the chicks were weighed before each exposure. Figure 6 shows the average weight per bird for each of the five different hatches during the progress of the study. Although the initial weights for each hatch lie slightly above the average curve, no striking effect of repeated exposure on body weight can be seen among the five hatches.

Discussion.—The impairment of cold resistance and the mortality experienced by the younger age classes when repeatedly exposed to cold was quite surprising, for both the severity and duration of exposure were moderate. However, both the reproducibility of the responses (1949 and 1950 results) and the differential responses of the younger and older age classes affirm it. Furthermore, 25° has previously been found to be the critical environmental temperature in the chicken, a related precocial form, for at temperatures lower than this 1 to 3 week old chicks huddled together when not feeding (Kleiber and Winchester, 1933). Cold resistance was studied in the pheasant by Long (1948), however this work is not comparable for his chicks were only exposed once, and high temperatures, fasting, and long exposures were employed. He concluded that temperature regulation in young pheasants was not fully developed at 15 days of age, irrespective of the plane of nutrition.

Apparently interspecific differences in cold resistance occur among precocial young. During the first week of life, pheasant chicks may show substantial drops in body temperature when exposed to 20° C.,

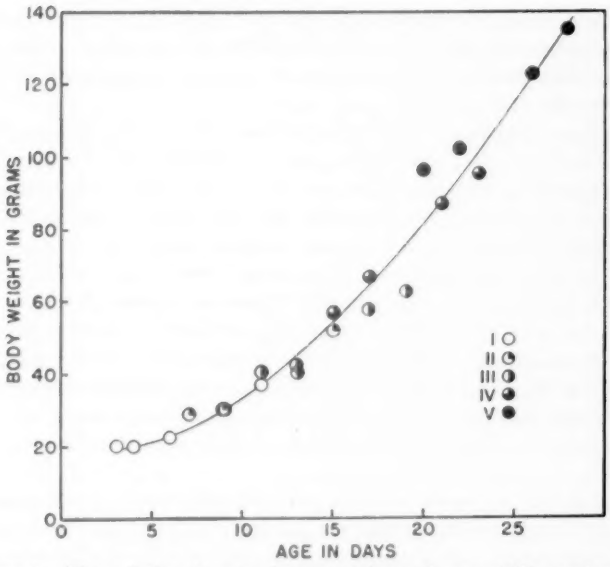

FIGURE 6. The relation beween body weight and age; 1950 results. Each circle shows the average of 6 to 10 chicks.

and at four weeks may still experience losses at 5°. Likewise in the chicken, another gallinaceous species, the young experience a rapid drop in body temperature at ambient temperatures of 20° during the first week, and protection against ambient temperatures lower than 20° is not complete until the down feathers are completely replaced by the adult plumage (Randall, 1943). In contrast Bartholomew and Dawson (1952) found that newly hatched Western Gulls (*Larus occidentalis wymani*) were successful in maintaining their body temperatures at ambient temperatures of 20° and above in the field, but that only the older nestlings could maintain their temperatures at 14 to 18°. However, the newly hatched gulls' success at 20° may have been due in part to behavioral thermo-regulation—the utilization of sunlight, wind shelter, and huddling to gain and conserve heat. Barth (1951) also has studied young gulls and found that complete homoiothermy, comparable to that of the adults, is not attained until the young can fly.

It was clear that a single chilling of a two- to three-day-old chick usually was not in itself fatal. Mortality and impairment of cold resistance were associated with repeated chillings. These detrimental effects appeared to be related to stress repetition and recovery time.

In nature, young pheasants could alternate peaks of muscular activity and broodings by the hen and would not necessarily experience repeated chillings of the same degree of severity as experienced by the chicks in this study.

Brooding during early life must be of the utmost importance for the survival of pheasant chicks, for environmental temperatures of 20° and lower are common in the field. No quantitative data were found in the literature concerning the brooding of chicks by adult pheasants, but its frequency and duration must be related to the environmental temperatures. Lehmann (1941) has field observations on the brooding of another gallinaceous species, the Attwater's Prairie Chicken (*Tympanuchus cupido attwateri*). Hens with young chicks were mainly concerned with watchfulness and brooding, and chicks less than seven days old were probably brooded about 50 per cent of the daylight period. During a timed brooding ten chicks (approximately two days old) spent 42 minutes out of 90 under the hen.

Field data on altricial species are available since observations can be much more readily made on young restricted to nests than on wandering forms. The studies of Brown and Davies (1949) on the Reed-warbler (*Acrocephalus scirpaceus*) revealed that the young of this altricial form are brooded frequently even during the daylight hours. The periods of brooding averaged between 60 and 70 per cent of the daytime during the first five days after hatching and dropped to zero by the ninth day. The extent of brooding was influenced by environmental temperatures. These altricial young certainly experience repeated drops in body temperature during the periods of inattentiveness. Baldwin and Kendeigh (1932) have measured the body temperatures of young House Wrens at the end of both the period of attentiveness and that of inattentiveness. In newly hatched wrens the body temperature dropped as much as 7.8° during inattentiveness, and for two nests of young the average drop was 4.3 to 0.8° during the first five days of life. Unlike the young pheasants these young wrens evidently experienced no detrimental effects from repeated exposure, and their cold resistance steadily improved.

The fact that there is a difference in capacity to resist cold between altricial and precocial birds was realized by Edwards (1824 and 1836–1839), who employed controlled exposures of young birds to study this problem. He found that a sparrow several days old lost 12° when exposed at 22° for 67 minutes. Three-weeks-old magpies lost 2° when exposed at 22° for 180 minutes, and 4° when exposed at 19° for 145 minutes. Three young Sparrow Hawks (*Accipiter nisus*) lost between 14 and 15° when exposed at 17° for 110 minutes.

The development of good resistance to moderately cool ambient temperatures is slower in altricial than in precocial species. House Wrens attained good resistance to exposure at 22° by nine days of age (Baldwin and Kendeigh, 1932); and resistance to 22° is almost complete in the Red-backed Shrike (*Lanius collurio*) at 11 days, in the Grass Parakeet (*Melopsittacus undulatus*) at 11 days, and in the Wryneck (*Jynx torquilla*) at 13 days after hatching (Böni, 1942). Previously, the pigeon was characterized by Pembrey (1895), who experimentally determined that temperature regulation at moderate ambient temperatures (19°) was well developed by 15 days of age.

Stoner (1928, 1935, 1937, 1939, and 1945) has published a series of interesting field studies on body temperature and growth in various altricial birds, but it is difficult to compare such observations directly with controlled laboratory studies. The complete thermal history of the young birds was not known, although ambient temperatures usually were measured before the body temperatures were taken. During the first days, body temperatures were taken immediately after the young had been brooded. In the species on which the measurements were most complete (House Wren, Barn Swallow [*Hirundo rustica*], Bank Swallow [*Riparia riparia*], Eastern Phoebe [*Sayornis phoebe*], and Northern Cliff Swallow [*Petrochelidon albifrons*]), the average body temperature of the nestlings of from 35 to 38° on the first few days had risen to from 41 to 42° by 14 days of age.

During much of their life in the nest the altricial species are essentially poikilothermous and can survive not only repeated chillings but also extremely severe ones. Kelso (1931) observed a nest of ten- to eleven-day-old Desert Horned Larks (*Eremophila alpestris leucolaema*) during a wet snow storm, and although two nestlings died, the other two survived body temperatures of 14–16°. On the next day the body temperature of one survivor had risen to 41.5° and the other survivor had left the nest. Previously, Leichtentritt (1919) had pointed out that young altricial birds are not harmed by exposure to cold and the resulting drop in body temperature and metabolism. Almost fully fledged young sparrows experienced drops in body temperature to 19.1 to 23.1° without ill effects. Considering the absences of the parents while they forage and the limited insulation afforded by the nest, he concluded that the incomplete heat regulation in young altricial birds is not as in the case of very young mammals a transient unreadiness, but rather a biological expedient which results in decreased food requirements.

There are intermediate forms between the typical altricial and the typical precocial species (Pettingill, 1946). At hatching, birds such

as owls and hawks may be covered with down but are helpless and are restricted to the nest. Barth (1949) has studied the development of cold resistance in one of these forms, the Snowy Owl (*Nyctea scandiaca*). He found during the first day of life that their temperature dropped to 25 to 29° during periods of inattentiveness. Although they were repeatedly exposed during the first 12 days of life, their cold resistance steadily improved. None of the ill effects experienced by the pheasants were manifested by the owls.

Wetmore (1921) remarked on the apparent anomaly of his single body temperature measurement on a young Mourning Dove (*Zenaidura macroura*), which was distinctly higher than those measured in other young altricial birds. He concluded that this was of interest in that doves have distinct affinities with groups having precocial young. However, young doves must be repeatedly chilled during periods of inattentiveness, for Gardner (1930) showed that at eight to nine days of age Mourning Doves dropped 1 to 3° in body temperature when exposed even to the high environmental temperature of 36°.

Thus it appears that the pheasant may pay a price for its precocity, in that unlike altricial and intermediate forms, cold resistance may be impaired and fatalities result from repeated moderate chillings.

Summary

The development of cold resistance was studied in young Ring-necked Pheasants. Although living in a hot thermal environment the body temperature of the chick is lower than that of the adult, and the regulated level of body temperature gradually rises during the first few weeks of life in a brooder to the adult level. During this period (2 to 15 days), exposure to moderate cold (20°) results in substantial losses in body temperature (2 to 4°). When two- to three-day-old chicks are repeatedly chilled by 30-minute exposures at 20°, the development of cold resistance is impaired, and they experience a high rate of mortality. Chicks of seven days and older are not adversely affected by repeated exposures at 20°, which instead improve their resistance to cold.

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Departments of Zoology and Physiology, University of Wisconsin, Madison, Wisconsin, May 29, 1953.

CRITERIA OF AGE OF INCUBATED MALLARD, WOOD DUCK, AND BOB-WHITE QUAIL EGGS

BY HAROLD C. HANSON

If field studies of birds are to continue to yield new findings that are qualitatively and quantitatively commensurate with the effort involved, techniques that yield new and more precise data must be constantly evolved. From more refined data, basic relationships that might otherwise be missed become apparent. This is particularly true in the case of the study of nesting birds, the eggs of which offer the possibility of more dynamic interpretation than is generally realized. With this in mind the writer developed a portable egg candler and a method of photographing incubated eggs with transmitted light.

The primary purpose of candling eggs is, of course, to ascertain the age of the embryos, and through the examination of many nests, to accurately and efficiently determine the chronology of the nesting season. Candling also enables the investigator to anticipate the date of hatching so that return visits, if desired, can be made on the appropriate dates and the final outcome of the nest more readily determined. In the case of altricial species such as the Mourning Dove (*Zenaidura macroura*), the visit can be so timed that the young can be banded just before they leave the nest.

Descriptions of a portable egg candler, an egg volumeter, and the technique of photographing incubated eggs with transmitted light have been presented elsewhere (Hanson, 1954, Journ. Wildl. Mgt., 18: in press). This report, primarily a continuation of the above report, presents photographs and notes on the developmental stages of three species: the Mallard (*Anas platyrhynchos*), Wood Duck (*Aix sponsa*), and Bob-white Quail (*Colinus virginianus*). These photographs should also be useful in determining the stage of development of eggs of other species whose incubation periods are similar. Photographs and notes on the incubation of Mourning Dove eggs will be presented later in conjunction with other studies of this species' nesting cycle.

The writer is indebted to William E. Clark, Natural History Survey photographer, for his patient assistance in preparing the plates showing eggs—which were made from admittedly difficult negatives; and to Francis J. Kruidenier of the University of Illinois Department of Zoology for a critical and helpful reading of the manuscript.

Criteria of Age in Incubated Eggs

The number of days an egg has been under incubation can be accurately determined with the aid of an egg candler for about the

first half of incubation; during the second half of incubation, when the egg becomes more opaque, aging becomes progressively less accurate as there are fewer observable characters on which to base an estimate. This is particularly true of large eggs but may also be true of small eggs such as quail eggs, which have an incubation period of about three weeks. The eggs of Mourning Doves usually can be accurately aged throughout most of their incubation since their development is so swift that day-to-day changes are quite readily recognized.

The following features and successive stages may be used as criteria in estimating the stage of incubation. They are presented in the approximate order of their appearance.

1. Color of the yolk and the distinctness of its outline. The yolk area becomes darker and more orange a day or two after incubation begins, the time element depending on the species involved.
2. Blastoderm becomes apparent.
3. Embryo first becomes visible.
4. Flexed embryo with beating heart plainly seen. Vitelline veins become visible giving the embryo spider-like aspect.
5. Embryo thickens, is obviously within an embryonic membrane, the amnion. Branching of vitelline veins becomes more obvious or visible.
6. Greatest distance between anterior vitelline veins.
7. Greatest diameter of *area vasculosa* as demarcated by the *sinus terminalis*.
8. Appearance of the amnion and length of flexed embryo.
9. Increasing diameter of amnion (the embryo not always seen as it moves about within the amnion).
10. Nature of embryonic movements, how rapidly the embryo flexes, whether it sways about within the amnion.
11. The extent to which the over-riding allantois obscures the amnion and enclosed embryo and the *area vasculosa* (see mallard, stages 8–11).
12. Position of embryo within egg.
13. Proportion of egg area occupied by embryo when the egg becomes too opaque for other structures to be seen.
14. Size of air sac.

For the sake of convenience, the structures listed above are reviewed in plate 15.

How readily these characters can be seen and/or their reliability depends upon the following factors:

1. Strength of light source.
2. Size and shape of egg.

3. Thickness of shell and amount of pigmentation.

4. Position of egg in the nest just prior to candling. If the egg has been in a tilted position in the nest prior to examination, the embryo and associated structures will be crowded at one end of the egg. Because curvature of the egg is greater at the ends, the diameter of the yolk sac, for example, will appear less than it would if the embryo is situated under the mid-portions of the shell. Usually up-ending the opposite end of the egg will cause an embryo in the early stages of development to float upwards and assume a more easily studied position near the center of the egg. Older embryos require more time to adjust their position.

The notes which follow on the appearance of the eggs of the Mallard Duck, Wood Duck, and Bob-white Quail at various stages of incubation are intended to supplement the photographs of the eggs (plates 16–21). Often they may offer only an approximation of the true situation within the egg, and would doubtless need considerable correction if revised on the basis of exposed and dissected material. The photographs of some of the stages admittedly are not completely satisfactory, but in the case of large eggs, such as the Mallard, they show more detail than is seen in a portable egg candler during the last half of incubation. Most of the details shown in the photographs of late stages of incubation can, however, be seen in a laboratory candler using a 75 watt miniature enlarging bulb. The reverse situation is also true. Detailed structures seen in a candler in the early stages of incubation could not always be photographed clearly despite repeated efforts. The heart, which was quite readily seen in nearly all eggs examined, did not register on film.

MALLARD (plates 16 and 17)

Fresh egg.—Egg, especially if shell is light colored, appears fairly translucent. No sharply demarcated zones; egg varies in color from whitish at the tips to light yellow and light orange at the center.

1st day.—Differs from fresh egg by darker hue of yolk area. The blastodisc, a small dark round spot about 4 mm. in diameter, can be detected in light colored eggs in the center of the yolk area when the egg is rotated.

2nd day.—Yolk area darker and better defined. *Area vasculosa* 7–12 mm., averaging 10 mm. in diameter.

3rd day.—Yolk area now a dark orange in color and its limits rather sharply defined. *Area vasculosa* spreading rapidly, now averages 20 mm. in diameter, its periphery demarcated by the *sinus terminalis*. Embryo now visible for first time, averaging about 4.5 mm. in length, and forms, in conjunction with initial lateral outgrowths of the vitelline veins, a small cross.

4th day.—"Heart-beat stage." Embryo flexed, 6–8 mm. in length, beating heart clearly visible. *Area vasculosa* averages about 30 mm. in diameter (25–32 mm.).

Anterior and posterior vitelline veins form in *area vasculosa* making the embryo appear spider-like. Greatest spread of anterior vitelline veins averages 19 mm. (15–24).

5th day.—Amnion becomes visible, varying from 6–9 mm. in diameter; the amnion, as well as the embryo within, sways about freely when egg is quickly rotated. Length of flexed embryo 6–8 mm. *Area vasculosa* averages 43 mm. (34–48). Greatest width between vitelline veins averages 22 mm. (19–32 mm.).

6th day.—Embryo now moves slowly to and fro (as a result of rhythmic contraction of muscle fibers in the amnion) and flexes. Eye is now very prominent.

7th day.—Embryo now, and for several subsequent days, is in stages of development that are not readily seen, since it moves about within the amnion considerably below the inner surface of the egg shell. The embryo also becomes less visible in successive days by the over-growth of the allantois, which spreads gradually out between the amnion and the chorion and the *area vasculosa*. Thus, the relatively simple radiating patterns of the veins of the *area vasculosa* become obscured by the vessels of the highly vascular allantois (days 8–11). These vessels, continuous over the flattened sac-like allantois, do not terminate in a peripheral vessel like the *sinus terminalis*, but turn under at the advancing lip of the allantois. Eventually the allantois surrounds most of the egg contents; its gradual advancement beneath the egg membranes and chorion can be seen in stages 8 through 11, the advancing edge being demarcated by the looped blood vessels. In relaxed flexed position, the embryo measures about 11 mm. in length. Amnion 22–29 mm. in diameter; *area vasculosa* now covers most of egg surface "below" air sac.

8th day.—Embryo 11–13 mm. long in flexed position; amnion 26–28 mm. in diameter. Air sac now increases more rapidly in size.

9th day.—Embryo 16–22 mm. long in relaxed yet flexed position; amnion 25–29 mm. in diameter. Embryo now very active.

10th day.—Embryo 25 mm. (22–27 mm.); amnion 35 mm. in diameter; eye 3–4 mm. in diameter. Kicking action of legs indicated by the spasmodic movements of the amnion and adjoining membranes.

11th day.—No significant change in embryo and amnion size measured. Embryo only moderately active; head and body about equal in size .

12th day.—Embryo about 33 mm. long; amnion about 40 mm. in diameter. Embryo movement now slow and gently pulsating. Embryo lies across shell in flexed position.

13th day.—Embryo in relaxed position occupies two-thirds of distance across egg.

14th day.—Embryo occupies four-fifths of distance across egg; embryo mass fills about two-thirds of dark area of the egg.

15th day.—Embryo moves slowly; lies in fairly tightly flexed position. Extra-embryonic blood vessels appear enlarged as compared with earlier stages.

16th day.—Little detail of egg contents now visible. Embryo occupies three-quarters of darkened portion of the egg.

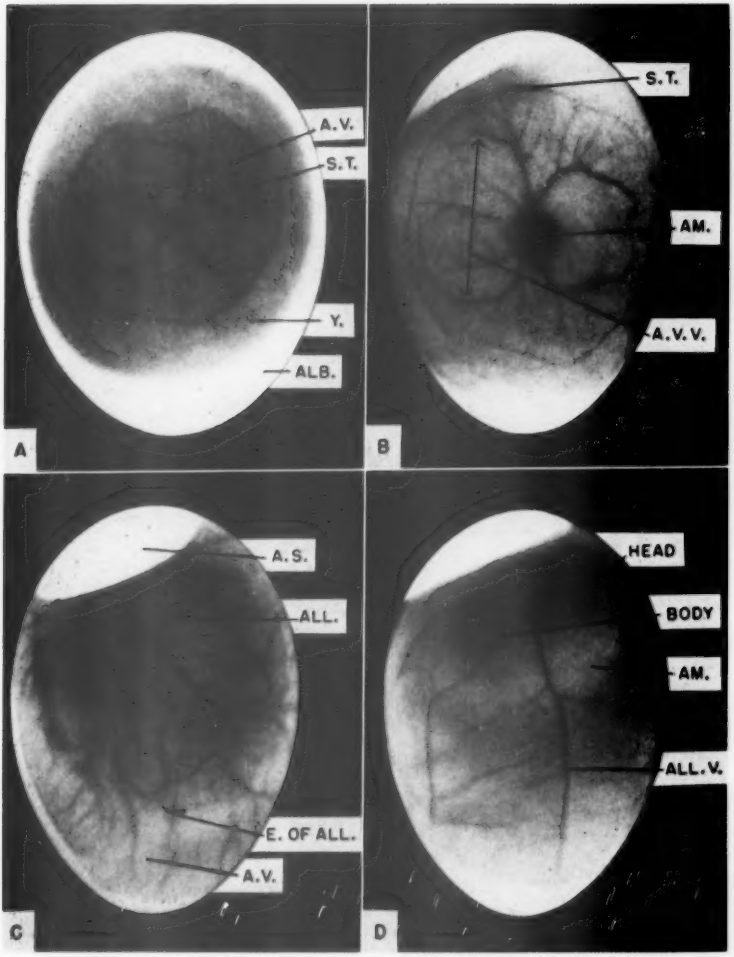
17th day.—Thick blood vessels at the small end of the egg only detail yet visible.

21st day.—Entire egg is opaque except for air sac and a small area at the small end of the egg.

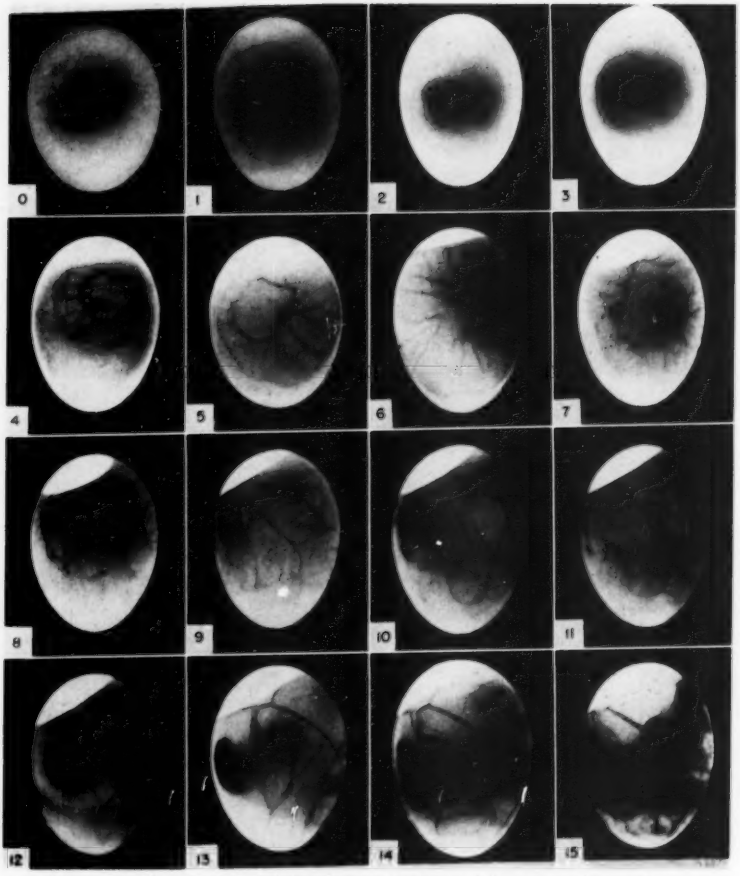
22nd and 23rd days.—Continuing increase in the size of the air sac is the only character that can be seen in these stages. If candling light is of low intensity, the air sac will be the only character easily seen after 12–14 days of incubation.

24th day.—Embryo active; can be heard moving about within shell.

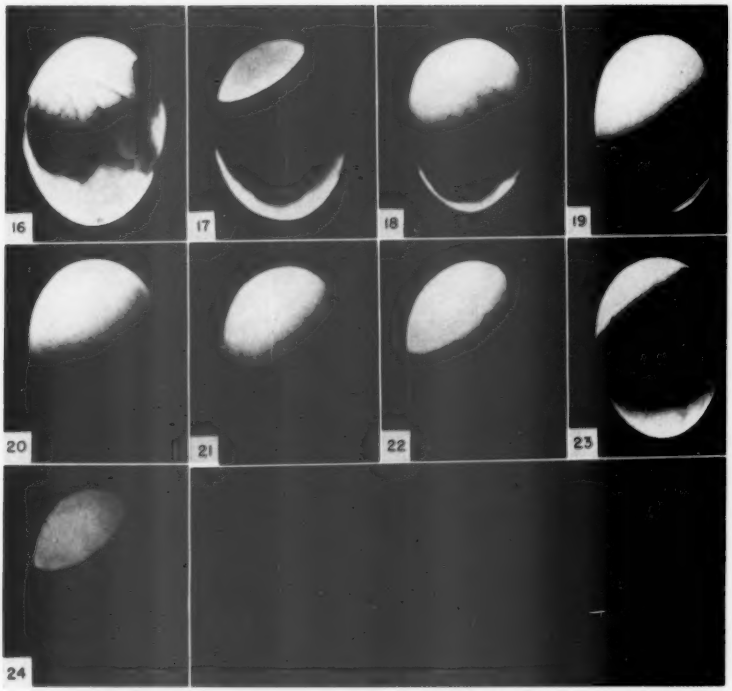
25th day.—Shell pipped and embryo has broken into air sac space.



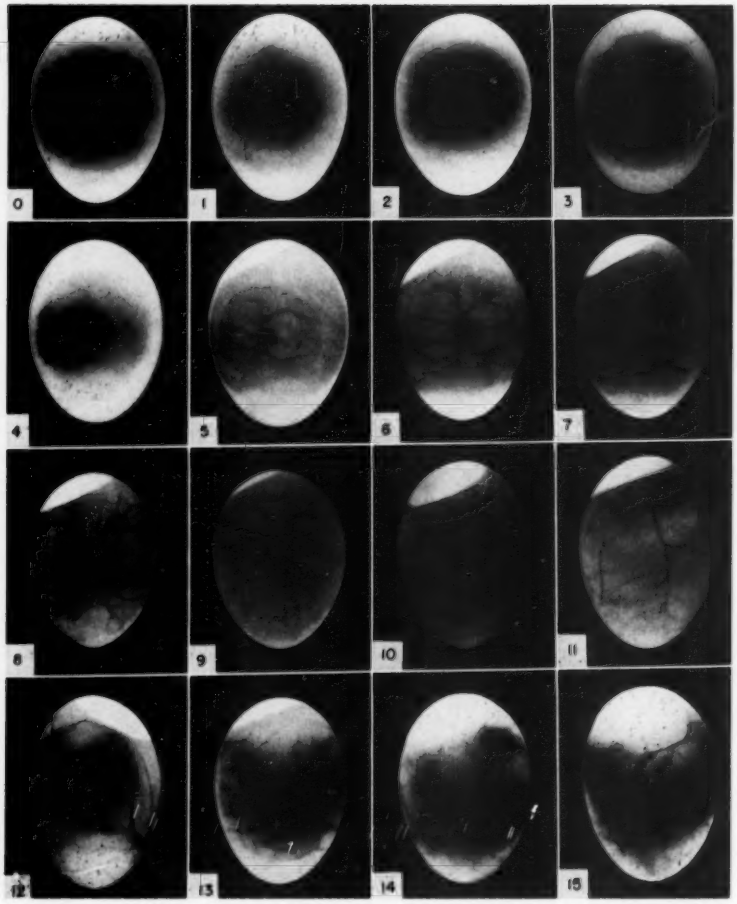
SELECTED STAGES OF WOOD DUCK AND MALLARD EGGS TO SHOW EMBRYOLOGICAL FEATURES USEFUL IN DETERMINING STAGES OF INCUBATION. A. Mallard at 4 days. B. Wood duck at 6 days. C. Mallard at 8 days. D. Wood duck at 11 days. Symbols: A.V.—*area vasculosa;* S.T.—*sinus terminalis;* Y.—yolk; Alb.—albumen; A.M.—amnion; A.V.V.—anterior vitelline veins; A.S.—air sac; ALL.—Allantois; E. of All.—edge of allantois; All.V.—allantoic vein.



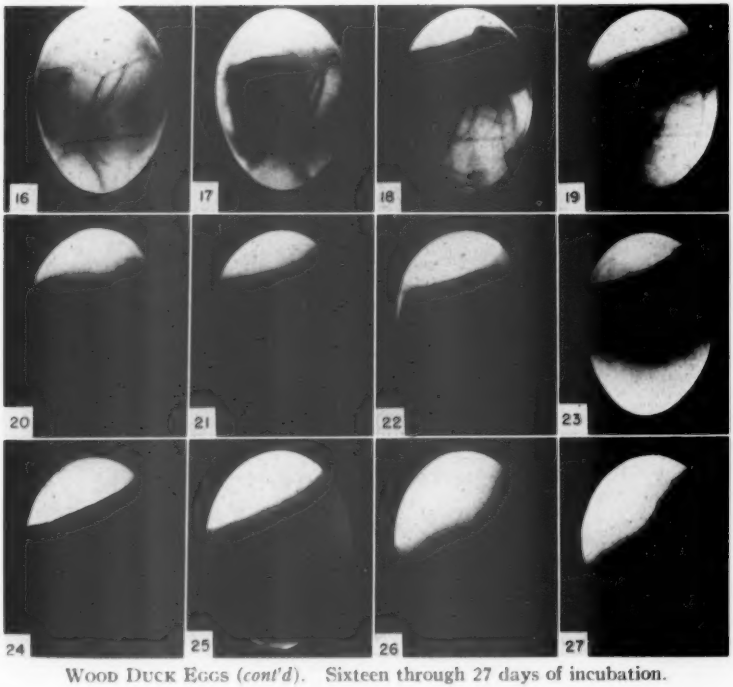
MALLARD EGGS. Days of incubation designated by numerals on plate.



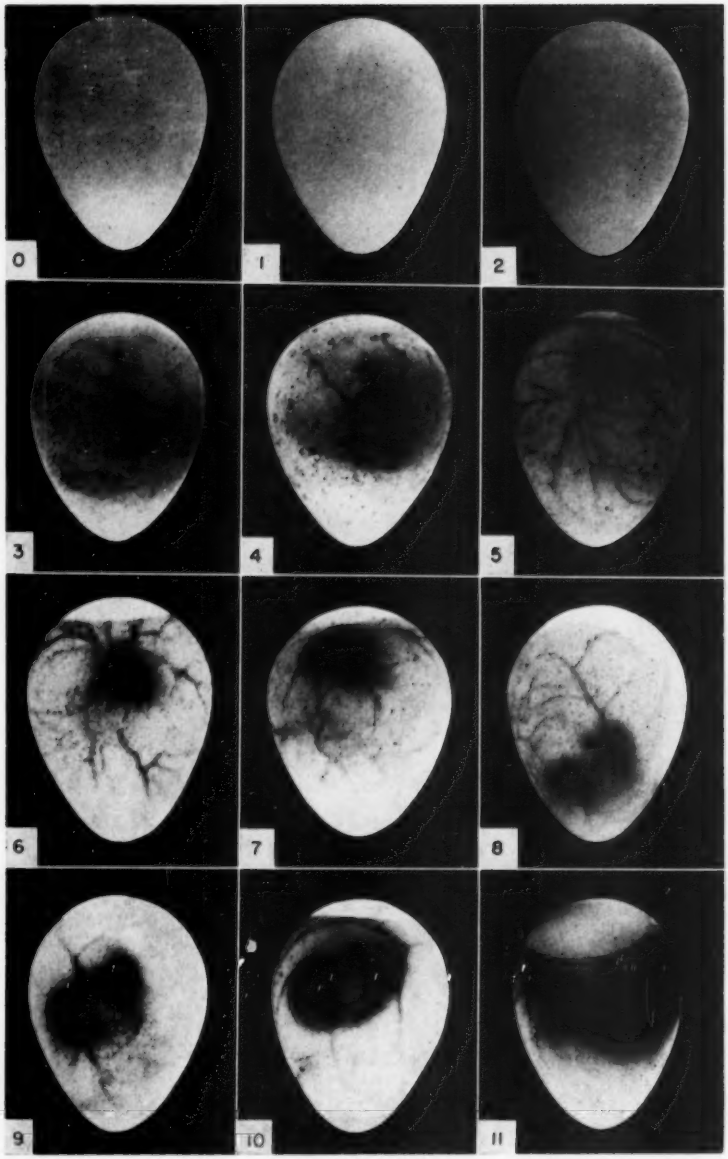
MALLARD EGGS (*cont'd*). Sixteen through 24 days of incubation.



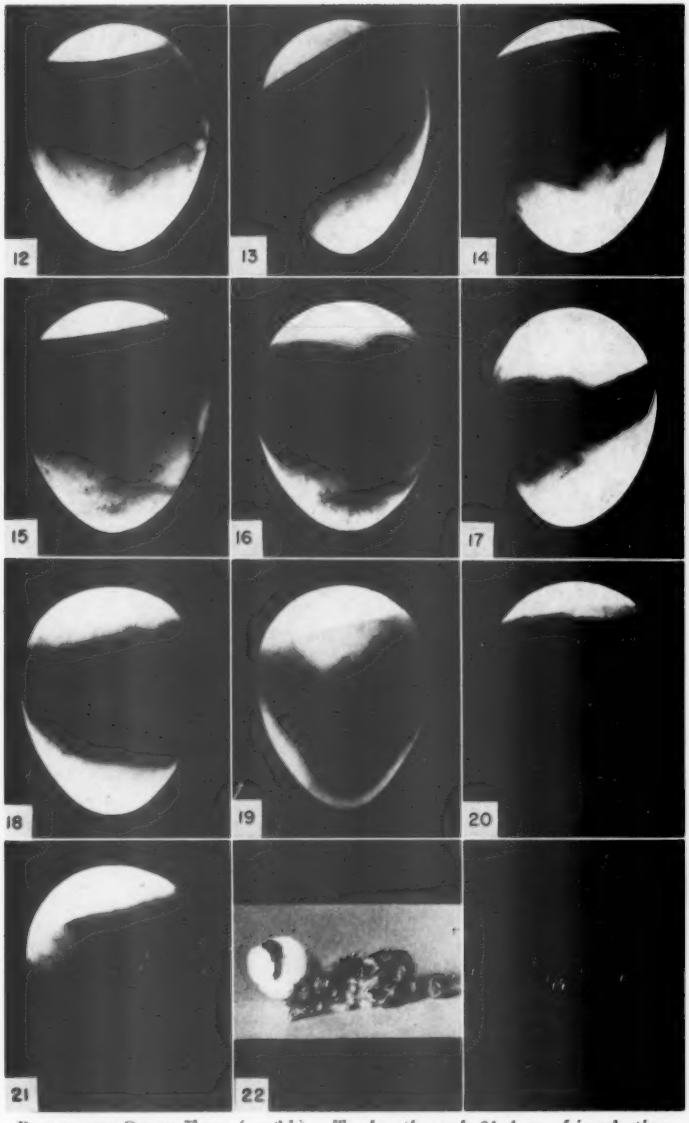
WOOD DUCK EGGS. Days of incubation are indicated by numerals on plate.



WOOD DUCK EGGS (*cont'd*). Sixteen through 27 days of incubation.



BOB-WHITE QUAIL EGGS. Days of incubation are indicated by numerals on plate.



BOB-WHITE QUAIL EGGS (*cont'd.*). Twelve through 21 days of incubation.

WOOD DUCK (plates 18 and 19)

Fresh egg.—Differentiation or contrast between yolk and albumen not prominent.

1st day.—Yolk area becomes somewhat darker and better defined. Primitive streak 1/16 to 1/8 in. in length—can be seen best when egg is slightly rotated, lies at mid point of yolk area.

2nd day.—Yolk area darker and well defined.

3rd day.—Blastodisc about 9 mm., lighter area (*area pellucida*) about embryo 4–5 mm., width of vitelline veins 4.5 mm.

4th day.—Embryo not strongly flexed, *area vasculosa* 16 mm. (Embryo is more easily seen with the aid of a green filter.)

5th day.—"Heart-beat stage," i.e. heart as a functioning organ readily seen for the first time. *Area vasculosa* 27 mm. in diameter; cervical flexure observable, embryo and vitelline veins appear spider-like in outline. Distance between anterior veins about 15 mm.

6th day.—Embryo 6–7 mm. in length, its outlines obscured by the rapid increase in size of the amnion; *area vasculosa* 41 mm. in diameter, greatest spread of anterior vitelline veins 15 mm. Vitelline veins now have many easily observed branches.

7th day.—Outline of the embryo as it lies enclosed in the amnion not readily apparent.

8th day.—Air sac shows sudden increase in size.

9th day.—Allantois spread about one-half way around air sac; embryo very active, about 12 mm. long, flexed.

10th day.—Allantois now surrounds all but about one-sixth of air sac; blood vessels of allantois less apparent due to lack of contrast. Embryo about 17 mm., flexed; eye spot 4–5 mm.

12th day.—Legs clearly seen and frequently moving.

13th day.—Embryo about 12 mm. long as normally flexed.

15th day.—Embryo lies openly flexed in a semicircle; its "diameter-length" is about 33 mm.; allantois now surrounds entire egg.

16th day.—Body of embryo about 19 mm.

17th day.—Embryo flexed to form a coil or ring for the first time; the wings and legs are now seen to move appreciably, the head and neck move occasionally, body more quiescent.

18th day.—Embryo now extends across shell and curves half-way around it.

19th day.—Embryo a compact mass; most of egg now black.

21st day.—Egg is all dark except for air sac and a small area at the extreme opposite end of shell.

BOB-WHITE QUAIL (plates 20 and 21)

1st day.—Yolk area shows some darkening, but is not sharply delimited.

2nd day.—No appreciable changes noted.

3rd day.—Embryo 4 mm.; blastodisc 8–9 mm. in diameter. These characters barely discernible.

4th day.—"Heart beat stage." Embryo about 7 mm. long, distance between anterior vitelline veins 12–14 mm. Embryo with vitelline veins has a spider-like appearance.

5th day.—Embryo 8 mm., and is now mobile. Eye spot visible; amnion 9–11 mm. diameter. Original vitelline veins now a vein complex.

7th day.—Embryo now moves about freely in amnion, but is not seen when egg cools, as it sinks in the amnion sac to inner part of egg. Amnion 16 mm. in diameter.

8th day.—Flexed embryo about 10 mm.; flexes and sways in amnion. Eye spot large. Air sac prominent for first time.

9th day.—Embryo 13 mm. in length, eye spot 3.5 mm.; movements within amnion slower. Egg is noticeably darker.

10th day.—Embryo about 15 mm., eye spot 4 mm., moves and flexes more slowly.

15th day.—Embryo now lies across width of egg near air sac.

16th day.—Only air sac visible in candler.

17th day.—Egg opaque; only air sac seen.

Illinois Natural History Survey, Urbana, Illinois, August 1, 1953.

RELATIONSHIPS IN THE NEW WORLD NINE-PRIMARIED OSCINES

BY HARRISON B. TORDOFF

WILLIAM J. BEECHER has performed a tremendously important service to ornithology through his studies of jaw musculature in passerine birds. His many dissections have given him a factual basis for deductions concerning passerine phylogeny (Beecher, 1950, 1951a, 1951b, 1953). Beecher has not hesitated to depart radically from existing classifications where his interpretations indicate that departures are necessary. This attitude is commendable. It is to be expected, however, that not all systematists will agree with Beecher's conclusions. Beecher recognizes this probability (1953:276) and rightfully suggests that where disagreements arise his published drawings of jaw musculature represent evidence to be reassessed. Perhaps one of Beecher's main contributions will be to call forth discussions from specialists with dissenting opinions. The present paper is an attempt to clarify the relationships of some of the New World nine-primaried Oscines, a group of special interest to me (Tordoff, 1954), utilizing Beecher's data where applicable. This group includes the following families of Hellmayr's "Catalogue of birds of the Americas": Vireonidae, Vireolaniidae, Cyclarhidae, Coerebidae, Compsothlypidae (= Parulidae), Tersinidae, Thraupidae, Icteridae, Catamblyrhynchidae, and Fringillidae.

Beecher (1951a:418–420; 1953:272–276) has made certain basic assumptions which require comment. Having first ascertained that the pattern of the jaw muscles provided useful differences between families and yet was constant within families, he assumed, for convincing reasons, that muscles with parallel fibers were more primitive phylogenetically than muscles with pinnate fibers. His second assumption is that a phylogeny may be reconstructed from a morphological tree of relationships of living forms. Clearly it is impossible to derive any living group from any other living group in a literal sense; instead, Beecher thinks that modern families of passerine birds are of great age. He (1953:273) postulates that certain insectivorous groups with parallel jaw musculature may date back to the Cretaceous Age essentially unchanged. More advanced groups with pinnate musculature he assumes to have diverged soon after the development and radiation of flowering plants in the Upper Cretaceous. Much or perhaps most radiation of birds seems to have taken place earlier than in comparable groups of mammals, but I can not avoid skepticism when I read that Beecher (1953:273) thinks that the Vireonidae (un-

known as fossils) have existed *as vireos* in the New World since some time in the Cretaceous. I grant that, lacking an adequate fossil record, birds must be classified on the basis of morphology and behavior of living forms, but I think that, in general, derivation of modern groups from other modern groups is unwise—especially in taxonomic categories of family rank or lower. The alternative, it seems to me, is to admit our nearly complete ignorance of the actual phylogeny of passerine birds and to label our reconstructed phylogenies based on modern birds as frankly hypothetical.

Beecher (1953:271–272) criticizes those systematists who, hoping "to by-pass the musculature," have studied avian osteology. He maintains that musculature is more conservative; that "osteological 'characters' [are] often the expression of only minor muscle slips." If this is true, then are we to abandon hope of ever learning much from the avian fossil record? It seems to me that changes in muscles and the underlying bones must usually go hand-in-hand. I think that Beecher's criticisms are justified only in part; what is needed is not less study of bones but more study of both bones and muscles. Although Beecher discusses the "convergence hazard" (1953:274–275), he has not, in my opinion, completely avoided it (see below). Some problems in relationship seem to yield best to studies of muscles, others to studies of bones. It is encouraging, however, to note the frequent close agreement, discounting different interpretations, between myological, osteological, behavioral, and other kinds of evidence.

ORIGIN OF THE NEW WORLD HIGHER PASSERINES

The New World nine-primaried Oscines (exclusive of the subfamily Carduelinae, family Fringillidae—see below) are, by almost unanimous agreement, an assemblage of families of close relationship and common ancestry. Opinions differ as to the stem stock, however. Wetmore (1951:12) recently reaffirmed his belief that the Fringillidae are the central group of this assemblage—"the modern expression of a main core or stem that through the earlier Tertiary periods has given rise to more specialized assemblages that we now recognize as distinct families." Glenny (1942:89) reached the same conclusion after a study of the arteries in the region of the heart. On the other hand, Beecher (1953:273) states that the Vireonidae (which he reduces to a subfamily of his Monarchidae) "gave rise to the entire nine-primaried American assemblage." Beecher's contention is based primarily on the fact that the vireos have the least pinnate—or most fully parallel—jaw musculature of the groups in question. Additionally, he (1951a) eliminates the Fringillidae as a potential stem stock because the

pinnate character of finch jaw muscles "may be too deep-seated genetically to be readily lost in a food adaptation." Such a loss would be required if the fringillids were the ancestral group (but see below).

I have previously (1954:31) presented in some detail my reasons for agreeing with Wetmore and Glenny in this matter. As is pointed out below, Beecher's data can, by reinterpretation, be construed as lending additional support to consideration of the Fringillidae as the central stock of the New World assemblage.

An explanation of the origin of the higher passerines which seems to explain both the jaw musculature and the bony palate of modern groups is as follows. I have presented (1954:22–26) evidence to the effect that the ancestral stock of the New World assemblage possessed palato-maxillaries as an adaptation to feeding on seeds or fruits. Beecher is convinced that the ancestral stock had largely parallel jaw musculature. In the modern descendents of the hypothetical ancestral stock, powerful biting or squeezing action of the jaws is accomplished in either one of two ways. The emberizines have perfected their adaptation to a hard diet by developing fully pinnate adductors of the lower jaw. The richmondenines seem equally well adapted to hard foods, but they have achieved this through maximum development of palato-maxillaries coupled with less fully pinnate jaw muscles than in emberizines. Perhaps the fully pinnate adductors of the emberizines have permitted the reduction of the palato-maxillaries seen in this group. If this is true, then the shift in diet from seeds to insects and back to seeds again which I postulated earlier (1954:26) to explain the emberizine palate becomes unnecessary.

This interpretation calls for ancestral stock with palato-maxillaries and with at least partly parallel jaw musculature, satisfying the hypothetical attributes required by both Beecher and me. Given this ancestral stock, derivation of the vireos (thin bill, largely parallel jaw muscles, fused palato-maxillaries) at an early date presents no unexplainable problems. The same can be said for derivation of other groups in the assemblage, some of which are discussed in more detail below.

ORIGIN OF THE CARDUELINAE

A major point of disagreement between Beecher and me has to do with the origin of the "northern finches"—the Carduelinae. These are supposed by Beecher to be derived from tanagers. My opinion is that the carduelines are related to the Estrildinae (= Estrildidae of Beecher) of the Ploceidae and are thus Old World in origin.

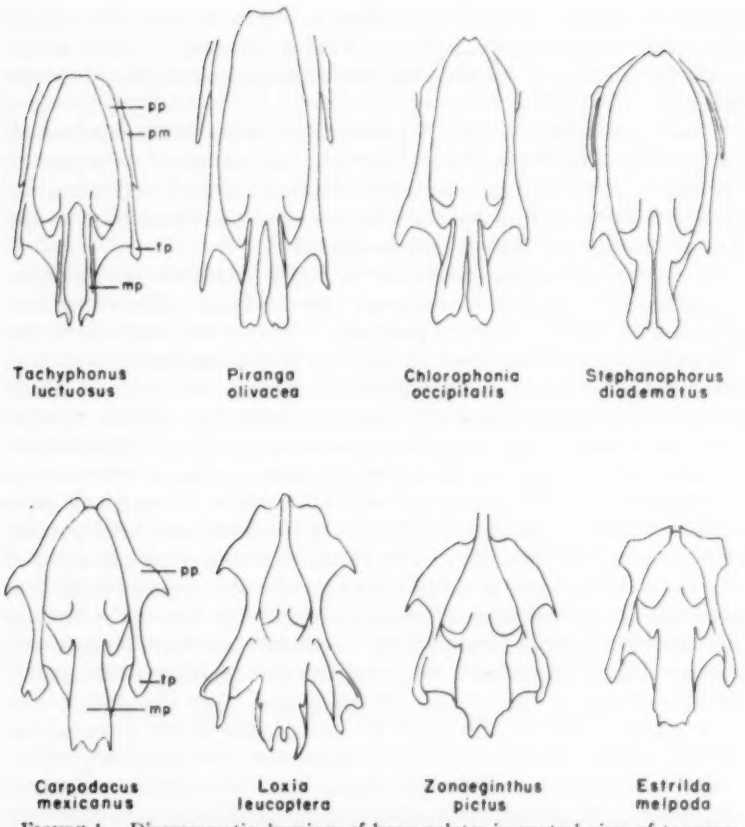


FIGURE 1. Diagrammatic drawings of bony palates in ventral view of tanagers, carduelines, and estrildines. Albbreviations are: pp—prepalatine bar; pm—palatomaxillary; tp—transpalatine process; mp—mediopalatine process.

Beecher's arguments (1951b:278–280; 1953:310–312) can be summed up as follows: the pattern of the jaw muscles of carduelines can be derived, without disjunction, from that of typical tanagers through the following series of genera: *Tachyphonus—Piranga—Habia—Tanagra—Chlorophonia—Stephanophorus—Carpodacus.* He states that the horny palate and plumage support the thesis of close cardueline-thraupid relationship.

In support of an Old World origin of the carduelines I have elsewhere (1954:18–20) presented evidence derived from the structure of the bony palate (see figure 1), distribution, migration habits, social

behavior, and nest sanitation. In all of these, the carduelines show close agreement with the estrildines. Additionally, a sharp break occurs between the tanagers and carduelines in the characters mentioned. I am not convinced that there is any significant resemblance in plumage between carduelines and tanagers. The superficial similarities in color (examples are the widespread occurrence of reds and yellows in both groups) probably are examples of adaptive convergence resulting from the forest-dwelling habit of most kinds in each group. This convergence is not nearly so convincing as the convergence in song, call notes, nesting, flocking behavior, and general proportions between, say, the cardueline genus *Leucosticte* and the emberizine genus *Calcarius*, yet no one postulates a close relationship between the latter kinds. Further, it has been well demonstrated (although not critically analyzed) that red pigmentation in carduelines differs from that in tanagers and in richmondenines. A major characteristic of red cardueline pigmentation is its instability—that is, it seems easily affected by diet and perhaps by climate (see Tordoff, 1952:203).

Beecher (1953:275) admits the possibility of convergence in jaw musculature, and I think the resemblance of carduelines to tanagers in this respect must result from convergence. If we assume for the moment that carduelines and estrildines are of common origin, the matter of jaw musculature remains to be explained.

Comparison of Beecher's illustrations (1953: figures 12 and 15 on pages 302 and 311) of the jaw musculature of estrildines and carduelines reveals, to me, no great differences. M7b (see Beecher's key to jaw musculature, 1953:277) is not pinnate in carduelines but is, seemingly, pinnate in estrildines. The ectethmoid foramen is single and slot-like in carduelines and double in estrildines (but single in other ploceids). Both single and double ectethmoid foramina occur in other passerine families. In other respects the two groups agree closely—even to the possession of posterolateral vaults in the horny palate of at least some forms of each group.

All things considered, there seems to be little evidence of close relationship between the carduelines and tanagers. Evidence for cardueline-estrildine relationship, on the other hand, is good. As stated elsewhere (1954:19), I am highly skeptical of the zoogeographic juggling necessary to derive the carduelines from the tanagers in the New World, and yet explain their present status as primarily an Old World group. In numbers of Recent species, in amount of generic endemism, and in adaptive radiation the carduelines would seem to be of Palearctic origin. The necessary postulation of arrival in the Old World of carduelines *before* the ploceids reached the Pale-

arctic—a postulation with no support in either fact or reason—is avoided by accepting the preponderance of evidence in favor of an Old World origin of the carduelines.

Beecher's (1953:312) allocation of *Fringilla* to the Carduelinae follows that of Mayr and Amadon (1951:28) and is not supported by the structure of the bony palate (Tordoff, 1954:23–24), although Beecher states that this structure in *Fringilla* has been modified as a result of the enlarged palatine salivary gland from the cardueline pattern. *Fringilla* is, in my opinion, a primitive emberizine.

ORIGIN OF THE PARULIDAE

Beecher (1953: 305, 307–308) unites the wood warblers and the emberizine finches into a single family, the Parulidae. The wood warblers are, according to Beecher, "the most slender-billed oscines with fully pinnate adductors" of the lower jaw. He lists some supposed adaptive advantages of this type of musculature for thin-billed birds. Ordinarily, however, development of pinnate adductors is correlated with increase in bill size—in turn correlated with seed-eating. It is difficult to understand the development of pinnate adductors in the thin-billed, mainly insectivorous and nectarivorous, wood warblers if they are, as Beecher states, directly derived from the thin-billed vireos—a group with largely parallel adductors.

Again, reinterpretation of Beecher's data provides an answer. In jaw musculature and in the structure of the bony palate, the wood warblers closely resemble the emberizines. Fairly close relationship between the groups is indicated, and the incongruity of fully pinnate adductors in the thin-billed wood warblers is readily explainable if, rather than considering the wood warblers as having given rise to the emberizines, we reverse the order. The logic of this arrangement strengthens the evidence that the Fringillidae represent the central stock of the New World higher passerines.

ALLOCATION OF CERTAIN FRINGILLID GENERA

Beecher includes *Guiraca*, *Cyanocompsa*, and *Passerina* in the Emberizinae. These genera have typical richmondenine bony palates (see figure 2). In nesting, song, coloration, and external structure they are richmondenine. I see no reason for removing them from their currently accepted position near *Pheucticus* in the Richmondeninae.

I agree with Beecher (1953:308) that the "sporophiline" finches are emberizine. Mayr and Amadon (1951:28) considered most of

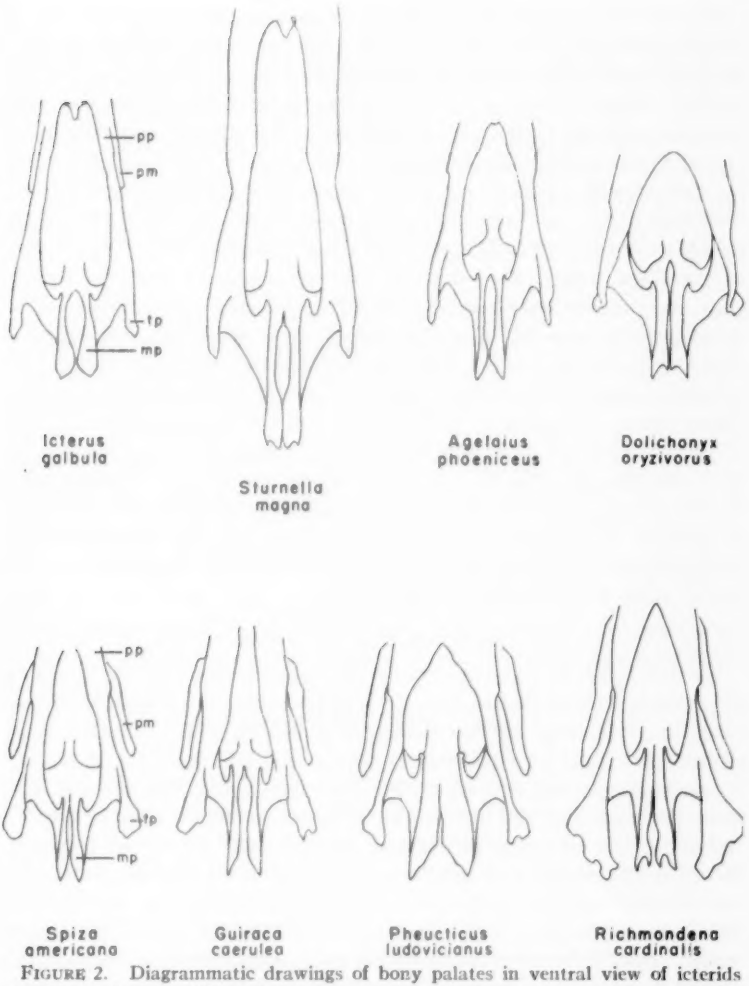


FIGURE 2. Diagrammatic drawings of bony palates in ventral view of icterids and richmondenines. Abbreviations are: pp—prepalatine bar; pm—palato-maxillary; tp—transpalatine process; mp—mediopalatine process.

them richmondenine. *Loxigilla* and *Melopyrrha* are placed by Beecher (1953:310) in the Pyrrhuloxiinae (= Richmondeninae), but he considers them convergent with the sporophiline group (Emberizinae) and recognizes that the two genera may really belong in that group. I think they are, in fact, emberizine, related to *Tiaris* and *Melanospiza*.

TAXONOMIC RANK OF THE GALÁPAGOS FINCHES

Extreme viewpoints regarding Galápagos finches are expressed by Beecher (1953:308), who regards them as worthy of full family rank, and the writer (1954:24), who included these finches with the emberizines and *Fringilla* in one subfamily, the Fringillinae. Beecher thinks that the Galápagos finches were derived from primitive emberizines—perhaps from the same stock as that which gave rise to *Melanospiza* in the West Indies (an idea first expressed by James Bond, 1948:222). I fully agree with this. Beecher, in his "diagnosis" of the Geospizidae, does not give any character or combination of characters which separates the "family" from the emberizines. For those persons who feel that the classification should clearly indicate that the Galápagos finches are monophyletic in origin (a point no one disputes), the best solution might be to retain the separate subfamily Geospizinae. (I agree with Wetmore, 1951:12–13, in being opposed to the use of tribes as a category between the genus and subfamily in birds on the grounds that it seems unnecessary and cumbersome.) In any event, I doubt that many ornithologists familiar with the birds in question will accept the lumping of carduelines, cardinal grosbeaks, and tanagers into one family with simultaneous elevation to full family rank of the Galápagos finches.

ORIGIN OF THE ICTERIDAE

Although Beecher and I agree on the major point that the Icteridae are derived from emberizine stock, I restate here my strong conviction that the Dickcissel (*Spiza americana*) is not an icterid (nor even an emberizine) but is an aberrant richmondenine (see figure 2). I discussed this in detail earlier (1954:29) but would like to state here that the supposed similarities in behavior between *Spiza* and the Bobolink (*Dolichonyx*) mentioned by Beecher (1951a:431) simply do not exist. Aside from the fact that both species live in open areas and usually migrate in flocks, there are no convincing similarities. Bobolinks prefer moist grassy fields; Dickcissels favor rank, weedy areas. Bobolinks have an elaborate song; Dickcissels have a simple, unmelodious song. Bobolinks regularly deliver the song in flight; Dickcissels usually sing from perches. Bobolinks, in their nesting, are typical of many ground nesters. The nest is built of grass; it is well concealed and not especially bulky. The eggs are grayish-white with many dark spots and blotches. Dickcissels build a surprisingly bulky nest of grasses and leaves. The nest may be on the ground, above the ground in weeds and bushes, or even in low trees. And most surprising of all, Dickcissel eggs are clear, unmarked blue. Additionally, Bobolinks display extreme sexual dimorphism in color;

in Dickcissels this dimorphism is one of degree only. Bobolinks have an 'eclipse' plumage and consequently two complete molts annually. Dickcissels lack an 'eclipse' plumage and the prenuptial molt is limited to the foreparts.

It must be admitted, however, that the Dickcissel does not fit well into any of the conventional groups of the New World assemblage, despite the typically richmondenine palate. Again I should like to state my opinion that *Spiza*, more than any other living genus, satisfies what I consider to be the requirements for the hypothetical fringillid stem stock.

ORIGIN OF THE DREPANIIDAE

I have no first hand knowledge of this group. It seems appropriate, however, to point out that Beecher (1953:312) found the Psittirostrinae strikingly similar in all respects (except plumage) to the cardueline finches. This similarity is equally strong in the structure of the bony palate (as shown by Amadon's figures, 1950:214). Almost all morphologists who have studied the group have postulated cardueline origin whereas Amadon favors origin from some coerebid- or tanager-like stock. Beecher considered the carduelines to be merely a subfamily of the Thraupidae and therefore is not troubled by these divergent opinions. For those who prefer to think of carduelines originally as an Old World group, however, the problem becomes important and I suggest that the question of origin of the family requires further careful study.

ORIGIN OF THE VIREONIDAE

If the vireos represent the central stock which has given rise to all other New World nine-primaried Oscines (which Beecher maintains) then the history of the bony palate of these groups becomes unexplainable. I see no way in which vireos, possessing fused, probably non-functional, palato-maxillaries, considered for the moment to be rudimentary, could have given rise to the rest of the New World assemblage, most families of which possess better developed palato-maxillaries than do vireos. As I pointed out earlier (1954), these bones are an asset primarily to birds with heavy, seed- or fruit-eating bills. I cannot see how wood warblers, as an example, would be under selective pressure to improve on the rudimentary palato-maxillaries of vireos. The fact that all New World nine-primaried Oscines have at least some trace of palato-maxillaries indicates that the ancestral stock possessed these bones—probably in functional condition. Thus, the traces of these bones in the thin-billed forms should be considered vestigial rather than rudimentary. Vireos, with their largely parallel jaw musculature and vestigial palato-maxillaries, seem to have

branched off from the ancestral finch stock earlier than any other living members of the New World group (see also earlier section concerning the origin of the New World higher passerines).

DISCUSSION

Having devoted some space to criticisms of Beecher's interpretations, I here restate my opinion that his studies are of great importance. He has provided a large number of data which are now available for evaluation and interpretation by all ornithologists.

The basic problem, the answer to which is the key to the validity of Beecher's interpretations, is whether parallel jaw muscles in modern birds are actually primitive. It seems likely to me that parallel muscles appeared earlier, phylogenetically, than pinnate muscles. But it does not necessarily follow that modern birds with parallel muscles have never, in their history, had ancestors with pinnate muscles. Stated another way, parallel muscles in Recent birds may at times be secondarily evolved. To use a hypothetical comparison, it might be proved that the earliest birds were black; it would not necessarily follow that all modern black birds are primitive in coloration. Instead, black coloration seems to have evolved repeatedly in independent lines.

As evidence that parallel jaw musculature in modern passerines is phylogenetically primitive rather than secondarily so, Beecher (1953: 329) cites the world-wide distribution of parallel-muscled groups. This pattern, he assumes, dates from Upper Cretaceous time. However, the groups with parallel jaw musculature and world-wide distributions are, in fact, groups of Beecher's own creation! He has united into the family Monarchidae, for example, birds with parallel jaw muscles (judged to be primitive on this basis) which other ornithologists have placed in no less than four families, not previously thought to be closely related. By so doing, Beecher has erected a world-wide family which has "primitive jaw musculature." To say then that the musculature is proved primitive by the world-wide distribution (a distribution which he thinks characteristic of Cretaceous insect-eaters) is clearly circular reasoning. Perhaps all that can be said is that both parallel and pinnate jaw muscles occur, in various groups, throughout the world.

ACKNOWLEDGMENTS

I am indebted to Robert M. Mengel for thoughtful advice and for careful perusal of this paper and to Jane S. Mengel for the drawings reproduced here.

SUMMARY

This paper is a summary and an attempted re-evaluation of some divergent opinions concerning relationships in the New World nine-primaried Oscines.

Beecher's (1950, 1951a, 1951b, 1953) work in particular is discussed and the following conclusions are drawn: (1) the New World assemblage of nine-primaried Oscines is of common origin and the central stock seems to have been the Fringillidae; (2) the Carduelinae are Old World in origin and probably related to the Estrildinae; (3) Beecher's thesis that carduelines are derived from tanagers is not supported by any available evidence other than that provided by the jaw musculature; the similarities in jaw muscles of carduelines and tanagers must be the result of convergence; (4) reinterpreted, the pinnate adductors of the lower jaw in the Parulidae provide additional evidence of fringillid origin of the family; (5) the question of taxonomic rank for the Galápagos finches is discussed and recognition of the group as a full family seems unwarranted; (6) Beecher and I agree concerning the origin of the Icteridae but disagree regarding the allocation of the genus *Spiza*, considered by Beecher as icterid and by me as richmondenine; (7) the anatomical resemblance of at least one subfamily, the Psittirostrinae, of the Drepaniidae to the Carduelinae is noted and further study is suggested; (8) the Vireonidae, considered by Beecher to be the stem of the New World assemblage, are shown to be derivable from primitive finches and the jaw musculature and bony palate agree with what, in my opinion, would be expected in an insect-eating group of finch origin; (9) circular reasoning is demonstrated in Beecher's argument that the world-wide distribution of the families with "primitive" jaw musculature supports the thesis that the groups are, in fact, primitive, since the families in question have been erected by Beecher from groups in various parts of the world which have parallel jaw musculature; (10) it is suggested that parallel jaw musculature in modern birds may often be secondarily evolved and thus not legitimately considered phylogenetically primitive.

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Museum of Natural History, University of Kansas, Lawrence, September 10, 1953.

NOTES ON FLAT-BILLS OF THE GENUS *PLATYRINCHUS* (TYRANNIDAE)

BY WILHELM MEISE

WHAT IS *Todus platyrhynchos* GMELIN?

As far as I know, R. von Ihering (1902) was the first to apply the name *platyrhynchos* to the South Brazilian Tyrant, up to that time called *Platyrhynchos rostratus* Latham (1790). Sclater (1888) had previously placed *Todus platyrhynchos* Gmelin at the head of the synonymy of this species, and therefore he seems to have been responsible for this application of the name. *Todus platyrhynchos* Gmelin, however, can hardly be the name of any bird of this sort from southeastern Brazil because at the time of its first use almost no small birds from that country had reached Europe. Pallas (1769) had seen a specimen of *Todus platyrhynchos* in the cabinet of the Prince of Orange, where he went sometimes during his stay at The Hague. He did not describe the olive-headed bird of southeastern Brazil, but his description clearly indicated a bird with leaden gray upperpart of the head: "Capitis vertex plumbei coloris, macula in medio oblonga alba . . . Dorsum fuscolutescens. Subtus tota avicula lutea, gula albicante. Remiges atque rectrices aequales fuscae . . ." No comparison with the length of the Nightingale is added beyond.

The plumbeous-headed group of flat-bills is not represented in southeastern Brazil, nor do we know of any black-headed species at all. The fact that Pallas saw the bird in the Prince of Orange's cabinet suggests Surinam as the locality for this bird. There, indeed, we find a single representative of the plumbeous-headed, white-crested group. Up to now this form was called *Platyrinchus senex griseiceps* Salvin 1897.

When Gmelin (1788) copied the description of the bird as given by Pallas and made it the only basis for his *Todus platyrhynchos*, he did not add any locality. Without repeating the full synonymy quoted by Hellmayr (1927) I propose the following changes, after having given the new citations for *P. platyrhynchos:*

Todus platyrhynchos Gmelin, Syst. Nat., **1**, pt. 1, 1788: 446, based on Pallas (1769) which is without locality: Surinam is suggested as type locality.

Todus rostratus Latham, Index Ornith. I., 1790: 268—new name for *T. platyrhynchos* Gmelin.

Todus atricapillus A. Lichtenstein, Cat. Rer. rariss., 1793: 17—without locality: Surinam is suggested as type locality (see below).

Platyrhynchus griseiceps Salvin, Bull. Brit. Ornith. Cl., **7,** 1897: XV—"Aunai" = Ourumee, British Guiana.

Therefore, *Platyrinchus senex griseiceps* Salvin 1897 becomes *Platyrinchus p. platyrhynchos* (Gmelin) 1788.

Platyrinchus platyrhynchos auct. nec Gmelin, 1788, becomes *P. fuscus* Vieillot, Galerie Ois., **1,** pt. 2, 1824: 201, pl. 126—Senegal: *errore.*

P. fuscus seems to be the oldest name for the species inhabiting southeastern Brazil. At the time of its description in 1824, the collections of Ferreira were worked up, and therefore many bird specimens from Brazil were studied for the first time, though they had been sent to Portugal long before (Stresemann, 1948).

WHAT IS *Todus atricapillus* A. LICHTENSTEIN 1793?

There are two interesting species of *Todus* among the many rarities of the cabinet of Holthuyzen, described by A. A. H. Lichtenstein (1793).

"*Todus platyrhynchos;* Gm. spec. 14. Pallas spicil. p. 19 t.3 C. Habitat in Sibiria." This locality was added, I suppose, because Lichtenstein knew Pallas only as a famous explorer of Siberia. "Obs. Noster magnitudinem Lusciniae haud aequat. Der breitschnäblichte Todier aus Siberien, mit plattem halbeyrunden schwarzem Schnabel. N. B. Viel kleiner als eine Nachtigall."

"*Todus atricapillus;* nobis. Antecedenti simillimus, nisi quod rostrum & mentum magis exalbidium; & venter dilutius flavus. Probabiliter antecedentis femina. Der schwarzköpfige Todier; dem Vorigen sehr ähnlich, nur dass der Schnabel und die Kehle weisslicher, auch der Unterleib hellgelber ist. Es ist wohl ohne Zweifel das Weibchen des Vorigen."

From this quotation it seems clear that *T. atricapillus* Lichtenstein was a *P. platyrhynchos,* the alleged differences from this species being due to some variation in age, since the black bill of Lichtenstein's "*T. platyrhynchos*" seems to indicate a bird not fully grown. The locality of both, then, would be in Dutch, French, or British Guiana, whence the 'Catalogus' records so many birds. I suggest Surinam as type-locality for *T. atricapillus* Lichtenstein.

THE THREE WHITE-CROWNED SPECIES OF *Platyrinchus*

The range of the blackish-gray headed *Platyrinchus platyrhynchos* (Gmel.) is almost completely encircled by those of the brown-headed species, *P. flavigularis* Sclater and the large olive-headed *P. fuscus* Vieillot. (One specimen of this species was kindly sent on loan by

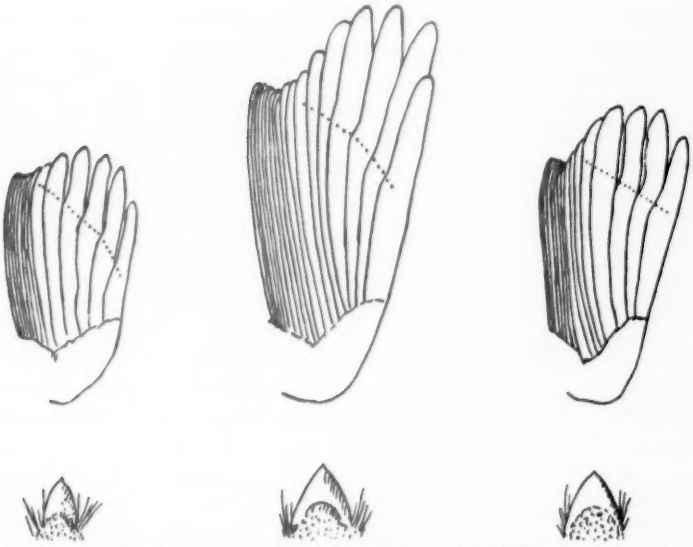


FIGURE 1. Wing from below and bill from below, of (*left*) *Platyrinchus m. mystaceus* Vieillot, specimen from Parana, March 4, Berlin Museum; (*center*) *P. fuscus* Vieillot, specimen without locality, British Museum, 58.3.5:2; and (*right*) *P. flavigularis* Sclater, specimen from Ramos Urcu, NE. Ecuador, September 7, Berlin Museum. For explanation, see text. The dotted line joins the points of attenuation of the inner webs, to show the propulsive part of the wing.

the authorities of the British Museum [Nat. Hist.].) Apparently they do not meet in eastern Brazil, but in Ecuador (Sarayacu in the extreme east) the ranges of *P. platyrhynchos senex* Sclater and Salvin and of *P. flavigularis* nearly touch. One specimen of the latter from Ramos Urcu (Río Napo) in the extreme north, female, 17 September 1932, is in the Zoological Museum, Berlin (Stresemann, 1937, *sub nom. P. s. senex*).

These three white-crested species of *Platyrinchus* differ from all the other species by their broader bills. Their wings are more pointed than all except those of *P. coronatus* (see figure 1).

SPECIATION OF THE FLAT-BILLS

The genus *Platyrinchus* comprises the following six species:

1. The Golden-crowned Flat-bill: *P. coronatus*.

2. The Yellow- and Cinnamon-crowned Flat-bills: *P. mystaceus* (including *cancrominus*, see Zimmer, 1939) and *saturatus*.

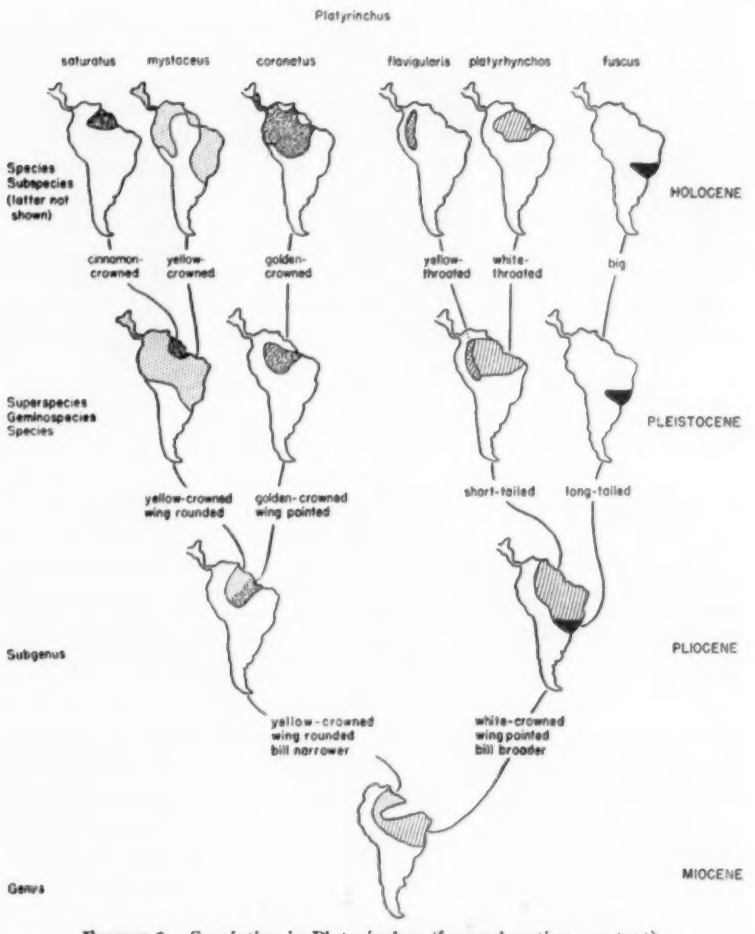


FIGURE 2. Speciation in Platyrinchus (for explanation, see text).

3. The White-crowned Flat-bills: *P. platyrhynchos*, *flavigularis*, and *fuscus*.

All four crown-colors can be found in the countries north of the lower Amazon River., *e.g.* in British Guiana.

Allopatric evolution, however, must not and cannot be excluded as shown in the rough maps—(figure 2).

The golden-crowned *P. coronatus*, which is widely distributed from southern Mexico to southern Brazil, seems to have arisen from a

stock near *P. mystaceus* and *P. saturatus*, retaining the narrow bill, short tail, and other characters of this group; but the wing is much more pointed, the ninth primary reaching beyond the fourth and the wing tip being 23 per cent of wing-length, more than in *fuscus*.

Within the white-crowned group, the three species must have originated in three different districts of tropical South America, the species *P. platyrhynchos* being nearer the original stock than *flavigularis* and *fuscus*, the two species of the outer circle of the group-area. *P. flavigularis* differs from all other members of the genus in having a yellow throat; *fuscus* by the relatively long tail (tail length multiplied by 100 and divided by wing-length = 60, as against 43 to 51 in the other species).

I think this group is farthest distant from the original stock of the genus because of its white crown, the very broad bill, and the pointed wing, which is not so pointed in *fuscus*, however, as it is in the other two (*fuscus:* primary 7 = 6 − 8 − 5 − 4 − 9 − 3; *platyrhynchos* and *flavigularis:* primary 8 − 7 − 6 − 5 − 9 − 4 − 3 − 2 − 1, *i.e.* the outermost falls between the fourth and third in *fuscus*, between the fifth and fourth in the two other species.

A survey of the characters of the six species may show their respective affinities:

	saturatus	*mystaceus*	*coronatus*	*flavigularis*	*platyrhynchos*	*fuscus*
Bill	narrow	narrow	narrow	broad	broad	broad
Crown	cinnamon	yellow	golden	white	white	white
Head	olive	brown olive	olive	brown	plumbeous	olive
Throat	white	whitish fulvous	yellowish olive	yellow	white	white
Tail/wing index	44	51	43	50	49	60
Ninth primary	<1	<1	4–5	4–5	4–5	3–4
Length of wing-tip in millimeters	18	19	23	27	25	19
Wing length in millimeters	57	53	56	59	67	76
Longest primary	6	6	7	8	8	6 = 7

My ideas on speciation in this group are presented with aid of maps showing the phylogenetic tree of the genus in time and space).

a) Tertiary (Miocene). Northern South America might have been inhabited by the first *Platyrinchus*, perhaps originating in the Guianas, where today most of the six species of this genus occur. The first geographical forms of this species were separated for a longer time by the Amazon Basin, at those times a relatively broad sea. Whether, in northwestern regions, the Llanos—sea in those days—formed the limit or not, I do not know.

b) In Pliocene South America the southern form, approaching the white crown character and acquiring a broader bill and more pointed

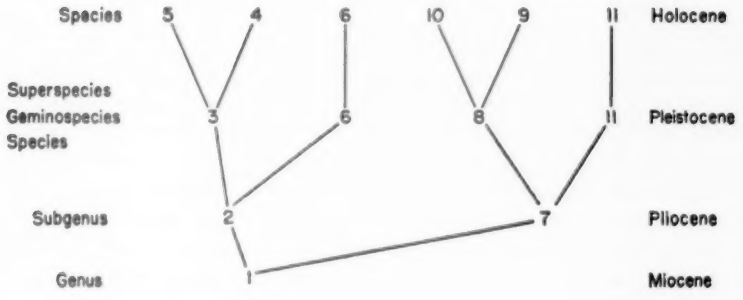
wing moved northward, across the Amazon Valley which had become narrower. This form did not hybridize with the northern form, which became a species (I) and later retained the primitive yellow crown for a longer period, round wings, and narrow bill. This species, in its turn, went to the south. Thereby we had two sympatric species in these parts of South America. The last-named yellow-crowned species developed into two subspecies and later species (by allopatry becoming later sympatric). In Guiana and neighboring districts, the northern, yellow-crowned, round-winged species (I A), which did not become very different from the original genetic stock, moved into Central America (perhaps during Pliocene time, Arldt, 1928). The southern subspecies—later species—(I B), Brazilian, developed a golden-crown and pointed wings. The southern form of the original species, however, divided into two subspecies (later species) of which one kept the short tail of the whole group (II A) and the other, a more specialized form inhabiting southeastern Brazil, acquired a long tail (II B). Later, this stock did not gain much area and has become our large *Platyrinchus fuscus*.

c) During the Pleistocene two more species may have originated, one (IA1) in the Guianas as a cinnamon-crowned subspecies of the widely spread yellow-crowned precursor of *P. mystaceus* (IA2), whereas the golden-crowned *coronatus* spread into Central America. During this period the white-crowned, short-tailed group (IIA) divided into a western yellow-throated (II A 1) and an eastern white-throated subspecies (II A 2).

d) During the Holocene period, during the last 10,000 years, the six species became established. I A 1 (the tropical life-zone *P. saturatus*) is relatively near to the subtropical life-zone *P. mystaceus* (I A 2) which in Central America has become the very different *P. m. cancrominus*-group of subspecies. The golden-crowned *P. coronatus* (I B) is a bird of the tropical life-zone. The white-crowned flat-bills (II) with short tails are now sharply divided into the yellow-throated *P. flavigularis* (II A 1) and the white-throated *P. platyrhynchos* (II A 2), whereas, as we said above, the large *P. fuscus* was split no more. (Perhaps *P. saturatus* in Guiana and *P. flavigularis* in the west of the Llanos Sea originated in the Pliocene period, the two stocks I and II thus being divided into three forms, each within this time).

The species which now stands nearest to the original stock of *Platyrinchus* (I/II) seems to be *P. mystaceus* (I A 2); the following scheme shows the branching of the *Platyrinchus* tree in a more simple manner, the numbers give the sequence of morphological similarities of all "leaves" on this twig of the avian tree.

BRANCHING OF THE GENUS PLATYRINCHUS



(The sequence of 1–11 gives an idea of the approximate morphological similarity of the forms that figure in the maps of figure 2. The degree of deviation, according to Hennig (1950) is shown by putting 1 nearly vertically beneath 4.)

SUMMARY

1. The white-crowned, plumbeous-headed species of flat-bills (*Platyrinchus senex griseiceps* Salvin 1897) should be known as *P. p. platyrhynchos* (Gmelin) 1788 (with *Todus rostratus* Latham 1790 and *T. atricapillus* A. Lichtenstein 1793 as synonyms), if not, under the new rules, *griseiceps* is applicable.

2. The large white-crowned flat-bill inhabiting southeastern Brazil should be known as *P. fuscus* Vieillot 1825.

3. *Platyrinchus flavigularis* has been collected in the Rio Napo district of Ecuador, this being the first record for that country.

The evolution of the six species of *Platyrinchus* in time and space is tentatively shown, based on characters and distribution. The ranges of the original stocks, of course, are very doubtful, but are based on the idea of an allopatric evolution of new forms and their consequently becoming sympatric.

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HYBRIDIZATION BETWEEN THE BOB-WHITE AND SCALED QUAIL

BY ROBERT A. MCCABE

THE Scaled Quail (*Callipepla squamata*) is known to hybridize with at least two other quails, the Gambel's, *Lophortyx gambelii* (Bailey, 1928) and the Bob-white, *Colinus virginianus* (Sennett, 1892). This paper is concerned with the latter cross.

In the fall of 1940, Elmer Hanson of Racine, Wisconsin, who bought and sold live wild animals, showed me a crate containing six quail. When asked to identify these birds I said they were Scaled Quail, although the coloring was generally darker and by no means typical. Hanson informed me these birds were hybrids between a Bob-white and a Scaled Quail.

The history of Hanson's birds is briefly this. He had held a pair each of Bob-white and Scaled Quail in the same pen awaiting prospective buyers. No such buyers materialized so Hanson was forced to hold the birds into the breeding season; and because space was limited, both pairs were kept in one small pen. Assuming that these distinct species would segregate during mating, no further thought was given to the birds until both females built nests and laid eggs. Hanson then noticed that the male Bob-white courted both hens and drove the male Scaled Quail from them. When the young hatched and were half-grown, the cross between the male Bob-white and female Scaled Quail was detected. The hybrids, six in all, represented a complete hatching of the six eggs laid. All were raised, and when I saw the birds in October of that year they were lively and appeared to be in perfect health.

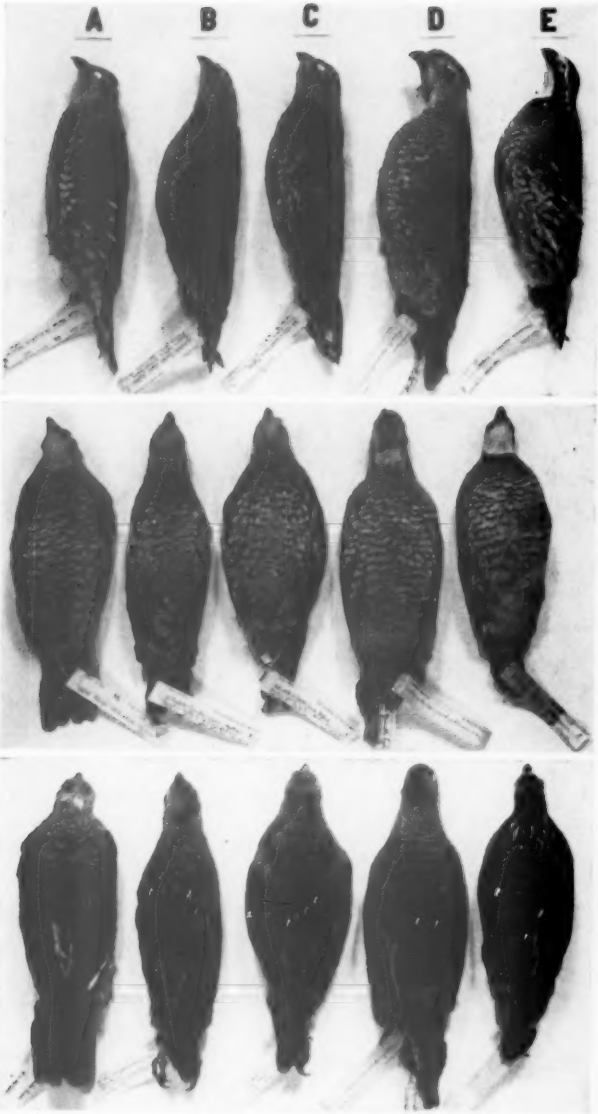
Dr. Raymond D. Owen, then of the University of Wisconsin's Department of Genetics, performed a laparotomy on each bird and found all six to be females. We had hoped to backcross the F_1 females with male Bob-whites for further study.

A weak bird was turned over to me for a museum skin. A second bird was killed and eaten by a cat. The remaining four birds died during the winter, thus the opportunity to backcross was lost. The skin of one of these birds was given to me by Hanson in 1951.

It is common knowledge among zoo keepers and game breeders that peculiar hybrids may be obtained in captivity. The interesting aspect of the Bob-white-Scaled-Quail cross, however, is that it can occur in the wild since in Texas and perhaps western Oklahoma the native ranges of these two species overlap (figure 1). Until Cockrum's paper (1952) appeared, I assumed that the two skins in my possession

FIGURE 1. The area of range overlap of the Bob-white and the Scaled Quail in Texas. (After Texas Game, Fish and Oyster Commission, 1945.)

were the only two in existence. Cockrum cites a French reference (Suchetet, 1897) as recording a similar hybrid occurring *in the wild*. On checking this reference, I found the hybrid was one mentioned by George B. Sennett in a paper read before the Linnaean Society of New York on April 1, 1891, and reported in the Abstracts of the Society's Proceedings (1892). There was also, however, a mention of this bird in the Abstracts for the year ending March 7, 1890 (p. 10) "Mr. George B. Sennett said he had come into possession recently of a well marked hybrid between the Scaled Partridge (*Callipepla squamata*) and the Bob-white (*Colinus virginianus*)." Since the label on the specimen indicates that it had been collected in January, 1890, it must have been received by Sennett shortly thereafter. I was unable to find any published description of this specimen. Suchetet, however, was apparently not satisfied with the one-sentence record of so important a hybrid. In his volume on birds (1897) he states that Sennett wrote him about the specimen. It seems likely that the letter was in answer to an inquiry by Suchetet. Sennett's letter, according to Suchetet, stated that the hybrid was shot in Concho County, Texas, in 1889, by Mr. Lomies, a landowner at Rauch. Unfortunately, these facts seem to have suffered, although not seriously, through the correspondence and subsequent translation. The original label on Sennett's specimen indicates that the bird was collected in 1890, by Mr. J. A. Loomis,



LATERAL, VENTRAL, AND DORSAL VIEWS OF (A) MALE SCALED QUAIL, (B AND C) FEMALE SCALED QUAIL × BOB-WHITE HYBRIDS, (D) MALE SCALED QUAIL × BOB-WHITE HYBRID, AND (E) MALE BOB-WHITE.

and no such locality as Rauch is listed. In fact, there is no town or township by that name in Concho County, or in Texas. The confusion concerning the locality is probably the fault of the translation to the French from Sennett's longhand letter. It is possible that the letter "n" in the word ranch appeared like a "u" and was therefore translated as the place name Rauch. Loomis was, according to Sennett, a well-educated man and a good hunter, so that his certainty of other hybrids in the covey from which the specimen was taken is given some credence by the latter.

Suchetet further records a description of the hybrid given him by Sennett from memory since the latter "was away" from the American Museum where the specimen was housed. The following is the description from the French, translated for me by Gaston Moisan, Quebec Department of Game and Fish: "On the top of the head can be seen a tuft composed of a few vertical feathers different from the feathers of *C. squamata;* they are wide and flat as the feathers ornamenting the head of *Colinus virginianus.* The breast is like *C. squamata;* the belly as *C. virginianus.* The back and the coverts are a mixture of the two species. The throat is white. The tail pattern, as far as he can remember, is a mixture. Sex is male. The specimen has been well prepared and is in perfect plumage."

I have examined Sennett's hybrid (courtesy of the American Museum of Natural History, New York City) and find his memory in this case was very accurate.

In plate 22 are shown five specimens: a male Scaled Quail (A), two female hybrids from Wisconsin (B and C), Sennett's wild-shot male hybrid (D), and a male Bob-white (E). The hybrid character of the color and pattern is most striking in the male hybrid. This is probably a result of inherited dimorphism from the Bob-white parent.

Ventral Aspect.—The hybrid male (D) has a white chin patch, whereas the two female hybrids (B and C) have ochraceous-tawny chins and throats not unlike that of a female Bob-white. The chin and throat of the Scaled Quail is light buff, and the distinction can be seen even in the black and white photograph. The characteristic black border of the chin patch of the male Bob-white is lacking in the male hybrid. There is, however, a patch of hazel-colored feathers on the chin below the lower mandible, which is unlike that of either parent species. The breast feathers on all the hybrids are very much like those of the Scaled Quail except that the black edging of the feathers is very narrow.

The belly feathers of the hybrids, particularly the male, are most like those of the Scaled Quail. Even the faint barring of the semi-

plume feathers of the abdomen resembles that of the Scaled Quail. The side and flank feathers of the ventral tract, which are best shown in lateral view, are similar in color and markings to those of the Bob-white, being tri-colored (black, brown, and white) but essentially Kaiser brown to hazel in appearance. The male hybrid (D) and female (B) show the light tear-shaped shaft marking on the longer flank feathers so characteristic of the Scaled Quail. The undertail coverts of the hybrids are marked like *Callipepla* but are tinged with reddish like those of *Colinus*.

Dorsal Aspect.—The neck of the male is very similar to that of the Scaled Quail, but as on the breast, it lacks the black edging of the typically squamate feathers. Both females, on the other hand, have much brown coloring in the neck and upper back, in which they resemble the Bob-white. The lower back and upper tail coverts of all hybrids are strikingly like those parts in *C. squamata*.

The edges of the exposed tertials in both parent species are light in color. Those of the Scaled Quail are white, and of the Bob-white, warm buff. The male hybrid is similar to the Scaled Quail in this respect whereas the females are like the Bob-white. All hybrids have the exposed tertials dark and finely mottled as in the Bob-white. This darkening and fine mottling is much reduced or lacking on the lower back and upper tail coverts of the hybrids. The tail feathers of the hybrids are essentially gray and more like those of the Scaled Quail although they show slightly more fine mottling.

Head.—The male cross has white on the forehead, and this runs back above the upper mandible. Although it is grizzled in appearance because of interspersed dark feathers, the Bob-white affinity is none the less obvious. The remainder of the crown is a dark mixture of browns and grays. The top-knot is longer than the Bob-white's crest but not as wide as that of the Scaled Quail and contains no white feathers to show a "cotton top." The side of the head in the hybrid male has the light-dark pattern of the Bob-white, but the sharply contrasting colors are lacking. A stripe over and behind the eye can be seen.

Both female hybrids show only a suggestion of a crest and have no white feathers. The lateral view of the heads of the females shows no distinct pattern, and the color shades from warm buff on the chin to tawny on the side of the head and over the eye. The auriculars are darker. The forehead, crown, and occiput are essentially cinnamon brown. The bill in all hybrids is more like that of the Bob-white showing a greater width and sharper curvature than found in Scaled Quails' bills. Likewise the lower mandible in both female hybrids is yellow at the base like that of the female Bob-white. I do not recall

the color of the iris and legs of the female hybrids and no information on the color of these parts is available for Sennett's bird.

Measurements.—All measurements taken fall within the range of both species (by sex) as given in Friedmann (1946). The results (in millimeters) were as follows:

	Culmen	*Tarsus*	*Middle Toe (without claw)*
Colinus virginianus ♂[1]	14.7–18.2 (16.3)	28.0–34.1 (31.5)	24.8–30.3 (29.3)
Colinus virginianus ♀[1]	14.0–15.5 (14.7)	28.5–34.0 (30.8)	25.5–31.0 (28.1)
Callipepla squamata ♂[1]	16.1–17.7 (16.7)	31.0–35.0 (33.0)	27.0–28.0 (27.4)
Callipepla squamata ♀[1]	15.0–17.2 (16.3)	30.5–34.0 (32.4)	26.0–28.0 (26.9)
Callipepla × *Colinus* ♂	16.0	33.4	29.6
Callipepla × *Colinus* ♀	15.6	31.8	27.5
Callipepla × *Colinus* ♀	15.0	32.6	29.9

[1] Friedmann (*op. cit.*)

One of the most interesting aspects of this case of hybridization is that it involved one monomorphic and one dimorphic species. It would be interesting to verify further the color-controlling mechanism through hormone studies and feather transplants. Although fertility of the hybrids seems likely, a backcrossing experiment would ascertain whether or not this were so. A final speculation on the merits of this hybrid for study is the possibility of observing the hybridization of behavior patterns.

Summary

Two captive-raised female hybrids between a male Bob-white and female Scaled Quail were compared with a wild-shot male hybrid and the parent species. There was a general overall hybridization of color, but the dimorphic coloration like that of the Bob-white, though subdued, was evident in the hybrids.

This cross is likely to occur where the ranges of the two species overlap in Texas and western Oklahoma.

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TRANS-GULF MIGRATION, SPRING 1952

BY HARVEY R. BULLIS, JR.

A HEAVY trans-Gulf bird migration during the spring of 1951 was described in a previous report (Bullis and Lincoln, 1952), which included a list of species observed and collected and weather tables. The observations were made from the M/V *Oregon*, an exploratory fishing vessel operated by the U. S. Fish and Wildlife Service, while the vessel was engaged in night trawling off the Louisiana coast. Further observations were recorded aboard the *Oregon* during the Spring of 1952. Observations made from March 31 to May 20, cover an east-west range of more than 600 miles on the open Gulf (from off Pensacola, Florida, to a position off Laguna Madre, Texas).

On the night of March 31, the *Oregon* was anchored at 29° 23.2′ north latitude, 88° 03′ west longitude, about 55 miles south of Mobile Point, Alabama. At 10:00 p.m. I was called on deck by a crew member who had spotted a few birds passing over. The afterdeck was lighted as previously described (Bullis and Lincoln, 1952: 35). A light, drizzling rain cut visibility down to a few hundred feet. The following notes were taken:

10:00 p.m. Several warblers flying under boom light; Mourning (?) Warbler, Redstart, duck (?). Southeasterly wind 18 to 24 m.ph. Low overcast, rain.

10:15 p.m. Ten to 25 warblers can be seen at one time. Rain lighter.

10:20 p.m. Rain heavy. Few more birds visible. Every minute or so a large bird flashed under boom light. Another duck. Purple Martin (?).

10:22 p.m. A large heron-like bird flew across stern. SE squall with driving rain. Least Bittern and Scarlet Tanager.

10:25 p.m. One swift. Least Bittern hovers under mast lights for 10 or 15 seconds. Lightning flashes reveal large groups of birds passing over the boat, heading north.

10:27 p.m. Eight to ten bitterns flew past.

10:30 p.m. Least Bittern hit the deck. At the same time two more hit the water off port side.

10:34 p.m. Swallows directly over head. Great Blue (?) Heron. Eight to ten species of warblers visible at one time. Rain lighter.

10:38 p.m. Two American Bitterns flew past. Another Least Bittern. Steady rain. Visibility about 200 feet.

10:42 p.m. Purple Martin landed on triple block lines. Flew off when I approached. Warbler landed on water next to the boat. Took off when I attempted to pick it up with a dip net. Was "sitting" on the water holding its wings high.

10:52 p.m. Searchlight on. More martins and smaller birds (larger than warblers) heading north. One Prothonotary Warbler. Another Least Bittern. Lightning shows 100 to 200 birds overhead beyond the lighting from the vessel. Rain picking up.

10:54 p.m. Sora Rail hit deck. Large grey bird landed on deck, took off immediately. Many Cliff Swallows, herons, bitterns. Warblers by the dozens. Rain very heavy from the southeast. Kingfisher overhead. Three Purple Martins

landed on the starboard boom stay. Another Kingfisher. Small, bright yellow bird flew by galley door.

11:00 p.m. More Kingfishers and herons.

11:02 p.m. Prothonotary Warbler landed on winch. Flew off after a few minutes. Kingfishers and herons directly overhead, heading north. Several large birds, appear to be Black-crowned Night Herons. Grey with black-topped heads. Calls sound like "caw-*wock*." Rain lighter, but driving. Southeasterly wind at

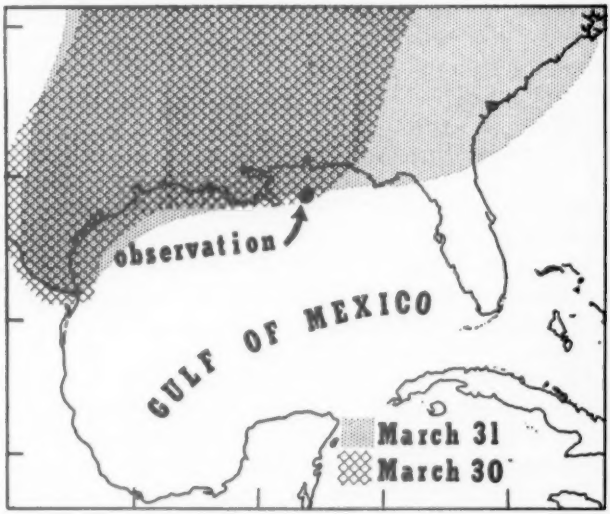

Figure 1. Areas of precipitation over southeastern United States during March 30 and 31, 1952. (From Daily Weather Maps for March 31 and April 1, 1952.)

20 to 25 m.p.h. A small, all red bird, under boom light for a second. Rain heavier. Still many warblers and larger birds. Martin almost flew into galley.

11:15 p.m. Rain coming down in driving sheets. No birds visible for a minute or two. Wind 30 to 35 m.p.h. Scattered birds hovering over stern.

11:18 p.m. Calls increase as rain becomes lighter. They entirely stop during heavy rain. Five to ten warblers visible at one time.

11:20 p.m. Rain lighter. A few larger birds. One reddish-brown bird the size of a martin. More Kingfishers.

11:30 p.m. Wind up to 40 m.p.h., southerly. Rain lighter but driving. Birds seen only occasionally. About 3 or 4 a minute.

11:33 p.m. Wind 50 to 60 m.p.h., gusts. Rain heavy. No birds.

11:37 p.m. Wind up to 85 m.p.h. No birds.

11:45 p.m. Wind started to shift around to west but came back to southeast. Gusts down to 50 to 60 m.p.h. Seas very rough. Florida Gallinule blown into galley.

11:46 p.m. Slight lull in wind, down to 30 to 40 m.p.h. Few gusts of 50 m.p.h. No birds.

11:59 p.m. Rain light to moderate. Wind 40 m.p.h. plus. No birds.

12:30 a.m. Lightning flashes reveal no birds. No calls heard. Rain moderate. Winds 20 to 30 m.p.h. Seas heavy. No birds seen or heard for the rest of the night.

TABLE 1

HOURLY PRECIPITATION (IN INCHES) AT VARIOUS U. S. WEATHER BUREAU STATIONS ALONG THE NORTHERN COAST OF THE GULF OF MEXICO FOR MARCH 31, 1952

	A. M. Hour ending at											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Galveston												.12
Port Arthur		T	.01									
New Orleans	.30	.02	.45	.10	T				T		T	T
Mobile	.02	.02	.03	.02	T	.04	.02	.08	.05	.04	.05	.30
Pensacola			T	.01	.02	.01	T	T	.06	T	.09	.58

	P. M. Hour ending at									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Galveston	1.80	1.19	.22	.22	.20					
Port Arthur	.03	.17	.10	.10	.12	.08	T			
New Orleans	.05	.41	T	.01	.01	.19	.21	.50	.17	.18
Mobile	.05	T	.39	.19					.01	.08
Pensacola	1.01	.77	.28	.33	.28	.03	T	T	T	T

For the two days preceding this observation the entire northern Gulf coast between Brownsville and Cedar Keys was blanketed in a heavy overcast and almost steady rain which extended inland for several hundreds of miles (see figure 1). The U. S. Weather Bureau records for March 31 show the following precipitation: Galveston, 3.77 inches; New Orleans, 2.60 inches; Mobile, 1.66 inches; and Pensacola, 3.76 inches. The hourly precipitation at several Gulf coast weather stations (table 1) further emphasize the exceedingly dismal conditions that prevailed. It does not seem likely that birds would be active in migration flight anywhere in this area. Williams (1950: 55) points out that rain has a very definite deterring effect on coastwise migrants and invariably brings about the precipitation of migrants which remain until the weather has bettered. Birds in the process of circum-Gulf flight would have stopped upon reaching the rain fronts in southern Texas and in northern Florida. On the other hand, birds leaving the Yucatan Peninsula would have no forewarning of weather conditions 500 miles to the north and, upon reaching the rain front along the northern coast, would have no alternative but to continue on to land.

During this period a cold front was in the process of moving down from the northwest, and it finally reached the northwestern part of the Gulf late in the afternoon of April 1. At the time of the observation this front was still more than 300 miles from any point on the Gulf coast and would seemingly have been too far inshore to have had any direct influence. Gentle to moderate southeasterly winds prevailed along the coast throughout March 31 and were accompanied by a slowly falling barometer.

By 1:30 p.m. a squall line had formed in central Mississippi, extending north to southern Michigan. During the afternoon this

line apparently "broke" in half and the northern line remained almost stationary (from Tennessee northward). The southern half moved southeasterly (preceding the cold front by 300 to 500 miles) and passed over Mississippi and Alabama and crossed the north Gulf Florida coast. At Mobile and Pensacola the fastest winds recorded were 20 m.p.h. (southeasterly) and 24 m.p.h. (easterly), respectively. Winds at New Orleans showed some shifting within the eastern quadrant with a fastest speed of 16 m.p.h. After the squall line had crossed the coastline and as it approached the *Oregon's* position, the prevailing southeasterly winds started to accelerate. The line crossed the *Oregon's* position at approximately 11:40 p.m. and at this point was accompanied by southeasterly winds of hurricane intensity and a driving, almost horizontal rain.

This squall line would probably have had little if any effect on birds that were in its path and already ashore. Along the coast, lowest temperatures following the line varied in the low 60's, and both the prevailing and fastest winds recorded along the northeast Gulf coast were neither from the proper direction to blow birds out off the coast (if any were in flight), nor of sufficient velocity to scare birds up off the ground. The atypical wind behavior of this particular line, which would usually be accompanied by a changing wind direction, was further substantiated by *Oregon* weather records which show the wind coming from the southeast preceding, during and following the passing of the squall.

Since the existing weather conditions strongly suggest the improbability of bird migratory movements either coastwise or overland at this time, it is assumed from the direction and behavior of the flight observed that this migration originated in the vicinity of the Yucatan Peninsula and had arrived at the point of observation by reasonably direct flight.

The following night (early morning of April 2) another short observation was made at the same position. The following notes were taken:

12:40 a.m. Birds coming over the boat. Wind NE × E, 8 to 15 m.p.h. Heavy fog impairs visibility.

12:44 a.m. Searchlight on. Visibility about 100 feet. Two crew members reported 5 "teal" at 10:00 p.m. last evening (April 1).

12:45 a.m. Warblers seen about one per minute. Call heard every few seconds.

12:50 a.m. Calls increasing. Large bird flashed under boom light. Two or three warblers can be seen at one time. Calls almost continuous. Fog appears to be very low over water (up to 20 or 30 feet) with the birds flying right above it; none seen near the surface of the water. Birds flying directly into NE wind.

1:00 a.m. Wind about 20 m.p.h. from the north. Birds seem to be making very little headway now.

1:10 a.m. Fog lifting. Calls fewer, about 2 per minute.
1:15 a.m. Warbler under boom light, flew off to NE. Larger bird crossed searchlight beam, heading NW.
1:25 a.m. Fog gone, sky clear. Only two calls in last 5 minutes.
1:45 a.m. Calls very scarce. One every few minutes. Sky clear but too dark to see anything.

On the afternoon of April 10, 1952, the *Oregon* was in the vicinity of 28° 25′ north latitude, 92° 28′ west longitude (100 miles south southeast of Cameron, Louisiana). During the morning there was some light rain with light southeasterly winds. Shortly before noon the wind changed to west-northwest and by early afternoon had steadied, coming from the northeast with speeds of 8 to 15 miles per hour. There was a slight lowering of the temperature (3 to 5 degrees), but the barometer held steady until that evening. The following notes were taken:

3:30 p.m. Three Pomarine Jaegers follow the wake of the vessel.
4:45 p.m. About 15 Gannets flying north—3 immatures and approximately 12 adults.
5:00 p.m. Twenty to 25 ducks several hundred yards ahead at approximately 1,000 feet elevation, heading northwest into the wind.
5:02 p.m. Three swifts flew past heading northwest. Flying very low over the water, almost skimming the waves.
5:15 p.m. About 15 small, dark birds flying a few feet above the water, heading northwest.

During the next hour several groups of birds (3 to 25 in each group) were seen heading northward.

The light northeasterly winds held until mid-morning, April 11, and then switched back to the southeast. The barometer dropped about 10 points at this time (to 30.18). It reached a low of 29.82 at 2:00 a.m., April 12, with winds increasing to 35 m.p.h. No birds were seen at night during this period, but occasional small groups of small birds were seen heading northwestward during daylight hours. The only specific record on this date was a Cliff Swallow that landed on the forestay for a few seconds. The other birds showed no interest in the vessel.

At 2:30 p.m., April 18, a Barn Swallow landed on the boat, position 26° 56′ north latitude, 96° 20′ west longitude (about 70 miles southeast of Aransas Pass and 55 miles off Padre Island). It appeared exhausted and was easily captured by hand. It was set free a few minutes later, but after circling the vessel a few times it returned and landed. A short time later it was killed flying against a cabin wall.

At 8:00 p.m. that evening, several small birds, for the most part warblers, were seen passing under the boom light. The *Oregon* was

on station number 552 for the following hour (25 to 30 miles east of the center of Padre Island). During this time the number of passing birds that could be seen at one time rapidly increased until *hundreds were continuously visible.* A Summer Tanager, two Orchard Orioles, and 10 to 15 warblers were retrieved after they had struck the rigging and fallen to the deck or into the water. Perhaps over a hundred fell beyond reach. A much more spectacular view of the flight could be seen from the crow's nest. The aureole of light caused by the reflection of the vessel's brilliant lighting gave me a clear view for several hundred feet. Thousands of passerine birds, none larger than orioles, could be seen. The entire flight was approaching the vessel from a southeasterly direction, that is, *from the direction of the open Gulf.* Apparently the light altered the horizontal flight path slightly, if at all, at least in the vicinity of the boat, for the birds continued in a northwesterly direction.

In the next thirty-five minutes the *Oregon* moved to station number 553, position 26° 54.6′ north latitude, 97° 03.4′ west longitude (17 miles east of Padre Island). While in transit, birds were visible continuously. At this last position one Baltimore Oriole, two Indigo Buntings, and several more warblers were collected. Hundreds of birds were again seen flying overhead and on both sides of the vessel in a northwesterly direction. There did not appear to be any specific altitude to this flight. There was an even distribution of birds from a few inches above the water to as high as visibility permitted me to see them. Thirteen species were collected at these two points as follows: Barn Swallow (*Hirundo rustica*), 1; Yellow-throat (*Geothlypis trichas*), 43; Kentucky Warbler (*Oporornis formosus*), 3; Redstart (*Setophaga ruticilla*), 2; Worm-eating Warbler (*Helmitheros vermivorus*), 1; Black and White Warbler (*Mniotilta varia*), 2; Tennessee Warbler (*Vermivora peregrina*), 1; Golden-winged Warbler (*Vermivora chrysoptera*), 1; Cerulean Warbler (*Dendroica cerulea*), 1; Summer Tanager (*Piranga rubra*), 1; Orchard Oriole (*Icterus spurius*), 2; Baltimore Oriole (*Icterus galbula*), 1; and Indigo Bunting (*Passerina cyanea*), 2.

At 10:30 p.m. the *Oregon* moved to station number 554, position 27° 03.5′ north latitude, 96° 56.2′ west longitude (25 miles off Padre Island), arriving there at 11:30 p.m.; at 12:30 a.m., April 19, proceeded to station number 555, position 27° 12.2′ north latitude, 96° 52′ west longitude; and at 3:50 a.m. anchored and spent the following twelve hours on station number 556, position 27° 20.4′ north latitude, 96° 40.2′ west longitude (35 to 40 miles southeast of Aransas Pass). The same general flight conditions as previously described with birds visible in great numbers until shortly before dawn. By 6:00 a.m.

no birds were to be seen. From mid-morning until late afternoon a light drizzling rain kept visibility down, and the only birds seen were Laughing Gulls.

This flight undoubtedly had the most advantageous weather conditions of all flights observed from the *Oregon* during the spring of 1952. Gentle to moderate winds had prevailed for several days. Temperatures ranged from the high 60's to the low 70's. Sky coverage

TABLE 2

WEATHER CONDITIONS, FOR THE AREAS UNDER OBSERVATION, FOR APRIL 18–19, 1952. (TAKEN FROM THE BRIDGE LOG OF THE M/V *Oregon*).

Date	*Hour*	*Wind (in miles per hr.)*	*Barometer*	*Temperature*	*Sky condition*
April 18	2:00 a.m.	SE 6–12	30.28	67	Partly cloudy
April 18	4:00 a.m.	SE 6–12	30.28	67	No data in log
April 18	6:00 a.m.	SE 5–12	30.26	68	Cloudy
April 18	8:00 a.m.	SE 6–10	30.29	68	Cloudy
April 18	9:00 a.m.	SE 12	30.34	70	No data in log
April 18	10:00 a.m.	SE 12–18	30.31	70	Partly cloudy
April 18	noon	SE 5	30.31	72	Cloudy
April 18	1:00 p.m.	SE 5–10	30.28	73	Cloudy
April 18	2:00 p.m.	SE 6–8	30.26	72	No data in log
April 18	4:00 p.m.	SE 6–8	30.22	72	No data in log
April 18	6:00 p.m.	SE 5–10	30.21	71	Cloudy
April 18	7:00 p.m.	SE 12	30.21		Cloudy
April 18	8:00 p.m.	SE 12–18	30.22	70	Cloudy
April 18	9:00 p.m.	SE 12		70	Cloudy
April 18	10:00 p.m.	SE 12–18	30.23	68	Cloudy
April 18	midnight	SE 12–18	30.23	68	Cloudy
April 19	2:00 a.m.	SE 8–10	30.19	66	Cloudy
April 19	4:00 a.m.	SE 6–12	30.16	68	Cloudy
April 19	3:00 p.m.	SE 12–18	30.09	64	Rain
April 19	4:00 p.m.	SE 6–10	30.07	65	Rain

varied from partly cloudy to overcast with openings. There was no rain or fog within 100 miles of the coast at any time on April 18. Rain started at the *Oregon's* position and over southern Texas in mid-morning on April 19, after the migration flight was presumably well inland from the Texas coast. Table 2 presents the weather data collected on the *Oregon* for this period.

At 5:30 p.m., May 19, the *Oregon* left the Pascagoula ship channel and pursued a southeasterly course in a line between Pascagoula and a point 100 miles west of Tampa Bay. For the following 24 hours the vessel traveled under a high, occasionally broken overcast and through intermittent rain. Southeasterly winds of 20 to 25 m.p.h. prevailed throughout the day. Shortly before midnight the wind swung around to the east and the velocity dropped to 12 to 18 m.p.h.

A cold front, moving from the northwest, had reached the northwest Gulf in the early afternoon of May 18. By 1:30 a.m., May 20, it was still west of the Mississippi Delta. At 2:00 a.m. (approximately 80 miles south of Mobile Bay) a large flight of warblers started passing over the boat *heading north* despite the easterly winds. No positive identifications were made, but 10 to 25 birds could be seen continually until 4:30 a.m., and I would estimate that thousands passed in view. After that time the numbers decreased steadily until daylight when only scattered individuals could be spotted. At 11:00, 11:20, and 12:00 a.m. small flocks of swallows (some were Barn Swallows) were seen heading northeast, some distance from the boat. Warblers were seen singly and in small groups for the rest of the afternoon and during the following morning. At 6:00 a.m. on May 21 (approximately 100 miles off Tampa Bay) a Louisiana Water Thrush and a Palm Warbler landed on the vessel and were collected.

In summary, from March 31 through May, 1952, migrating birds were seen out over the open Gulf between southern Texas and the west coast of Florida. Over this wide range (actually spanning the entire northern Gulf) birds were observed in northward flight, singly, in small groups, and in mass congregations, under many different weather conditions. All of the major flights observed took advantage of favorable southeasterly winds. When migrating birds encountered head-winds associated with cold fronts that had moved from the land out over the Gulf, they proceeded to fly into the adverse winds, hence, in the direction of the northern Gulf coast. No birds were seen fleeing before a cold front. Some of the birds seen in the course of these observations could naturally have been displaced strays. Judging, however, from the directional trends and other characteristics of the flights and the observed circumstances surrounding them, there can be little doubt that they represent a great volume of birds in the process of making an intentional trans-Gulf migration.

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Fish and Wildlife Service, United States Department of the Interior, Washington 25, D. C., May 22, 1953.

A HISTORY OF SOME BALD EAGLE NEST SITES IN EAST-CENTRAL FLORIDA

By Joseph C. Howell

Between 1928 and 1935 the writer became concerned at the apparent decrease in numbers of the Bald Eagle (*Haliaeëtus leucocephalus*) in east-central Florida. In 1935 a study was initiated to determine the population trend of this bird in this area. Careful note was taken of the location of the nests of 24 pairs of eagles in Brevard and Volusia counties. The plan adopted was to revisit the nest sites of these pairs of eagles at intervals of five years and count the number of pairs remaining. Earlier reports on this study have appeared as follows: Auk, 54: 296–299, 1937; Auk, 58: 402–403, 1941; and Auk, 66: 84, 1949.

Revisits to these nest sites have always been made during the latter half of December since at this season most pairs of eagles are at their nests. The status of each nest site is recorded in one of the following three categories: 1. occupied, 2. active, 3. unoccupied. Occupied nest sites are those at which the nest is thought to contain eggs or young. Such nests nearly always have an adult sitting on them. This category is the least arbitrary of the three and nearly always represents a currently breeding pair of eagles. The second category includes those nest sites at which an adult or a pair of adults is seen, but at which no nest is found or at which the nest is judged not to contain eggs or young. The third category, the unoccupied nest sites, includes those at which no adult is seen.

The procedure used at each nest site is to observe first the tree in which was located the most recently used nest. If the nest is no longer present a search is made of all or as many as possible of the suitable nest trees within a radius of one mile. Usually three days have been available for making the rounds of these 24 nest sites.

With the cooperation of the Florida Game and Fresh Water Fish Commission, it was possible at the close of the 1951 count to check the efficiency of my search from the ground by studying the same nest sites from the air. The Commission patrols much of the state from light, cub-type planes. On December 19, I accompanied Conservation Officer Beville on his patrol. We flew over the sites at which an occupied nest had not been found. At one site where a bird had been seen but no nest could be located, we found an occupied nest from the plane. At another site which had been listed as unoccupied we found a nest. Later I learned that this nest was occupied.

Searching for eagle nests from the air proved to be more efficient than ground searching. From a plane it is possible to search a great

deal more area in much less time. With the exception of a few nests located in the dense tops of living pines it was possible to see an eagle that was on or near a nest. It was found necessary to fly at an altitude of about 500 feet during the course of each search.

One important assumption underlies the results obtained in this study. It is assumed that a pair of eagles will not move more than one mile from its original nest site. This assumption rests on the observation that individual eagles are very strongly attached to the immediate area around the nest. When a nest is destroyed or the eagles driven away from it, the pair will usually construct a new nest within a mile, and often within a few hundred yards of the original nest site.

It seems unlikely that both members of many pairs of eagles survived over the duration of this study. The continued occupation of a particular nest site may depend on the continuing survival of one member of the pair using the site, or upon the use of it, on maturity, of young birds raised at the nest site. An alternative possibility is that a particular nest site is so located in relation to the environmental features of the region that it fits particularly well the territorial requirements of this species and is thus continually reoccupied in the event of a mishap to one or both members of the original pair.

Unfortunately there are no data on the nesting habits of banded adult Bald Eagles. There is however some suggestive evidence indicating that the same individual eagles use a particular nest site for more than one year. The pair at nest site 16 was for a number of years the earliest of these 24 pairs to lay its eggs. It was the only pair which was known to have laid its eggs in October. Later the pair at this nest laid consistently later in the season, presumably due to a change in at least one member of the pair since a plumage peculiarity appeared in one member. Other pairs were, for a number of consecutive years, later than the average in laying their eggs.

Following the reassessment of all the data in 1951, it was decided to reinterpret them in terms of percentage of occupied nest sites. This is also a percentage of surviving pairs and is determined by dividing the number of currently occupied nest sites by 24. In the earlier analyses of these data a percentage of decrease was determined by dividing the currently unoccupied number of nest sites by the original number of nest sites (24). The new method has the advantage of presenting positive information. It states that a certain percentage of the original number of nest sites is currently occupied by a pair of eagles.

In the earlier reports of this study it is now thought certain inaccuracies existed. It was decided after carefully restudying all the data that what in one instance had been considered two pairs was in reality only one; and two pairs included in earlier calculations have been omitted because their histories are incomplete and two pairs with complete histories have been used instead.

TABLE 1

A SUMMARY OF THE HISTORIES OF 24 BALD EAGLE NEST SITES

Site Number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1935	O	O	O	O	O	O	O	O	A	U	O	O	O	U
1940	O	O	A	O	A	U	O	O	A	O	U	A	U	U
1946	U	O	O	U	A	A	O	U	O	U	U	U	O	O
1951	U	O	O	U	A	A	O	O	O	U	U	U	O	O

Site Number	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*Per cent of Sites Occupied*
1935	O	O	O	O	O	A	O	O	O	O	83
1940	A	O	O	O	O	U	U	A	O	U	46
1946	O	O	O	U	O	U	U	O	O	O	54
1951	O	O	O	A	O	O	U	O	O	U	58

A—sites at which at least one adult was seen but at which there was not a nest judged to contain eggs or young.
O—sites at which there was a nest judged to contain eggs or young.
U—sites at which no adult was seen.

Table 1 above summarizes the histories of these 24 nest sites for each of the years during which they were visited. While each of the original nest sites was selected because of the presence of a well-built nest, it should be noted that not all of these were occupied even in 1935. The percentage of sites occupied varied only between 46 and 58 from 1940 to 1951. It is unlikely that these differences are actually significant. It is likely that each year some occupied nests are overlooked. As reported above the 1951 air search showed that two nests that were not found during the ground search were occupied. In the above table these two nest sites are reported as unoccupied (10) and as active (18) in order that the data for 1951 can be compared with those of earlier years. It is thus true that in 1951 at least 67 per cent of the nest sites were actually occupied and this is but 16 per cent less than the figure at the start of the study. Furthermore, if two new sites occupied in 1951, but established after the start of this study, are taken to be replacements of nest sites which are unoccupied, they indicate that the actual population in the study region may have decreased very little since 1935.

It is apparent from the above discussion that the use of percentages above gives a false sense of exactness to the data secured during this study. By way of summary, I would interpret the data as probably indicating that this group of nest sites was occupied in 1951 by from 70 to 90 per cent of the pairs occupying these sites in 1935.

Contribution No. 65, Department of Zoology and Entomology, University of Tennessee, Knoxville, Tennessee, June, 1952.

TWENTY-NINTH SUPPLEMENT TO THE AMERICAN ORNITHOLOGISTS' UNION CHECK-LIST OF NORTH AMERICAN BIRDS[1]

THIS supplement covers changes in name and status, as well as additions to the Check-List, accepted by the Committee on Classification and Nomenclature during the year 1953. The Committee held sessions at the meeting of the A.O.U. in Los Angeles and conducted much additional business through the circulation of memoranda by mail. Revision of ranges for the fifth edition of the Check-List has now advanced to the stage of incorporating the many useful corrections and additions the Committee has received from collaborators.

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Page

1. *Gavia immer elasson* Bishop is now considered inseparable from the nominate form. The species is thus monotypic and reverts to binomial status. It will stand in the Check-List as *Gavia immer* (Brünnich). See Gabrielson and Lincoln, Condor, vol. 55, 1953, pp. 314–315.

29. *Bubulcus ibis ibis* (Linnaeus). Cattle Egret. [200.1] *Ardea Ibis* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 144. (Aegypto = Egypt.) Additional genus and species. Breeds in Florida; also recorded in Illinois, New Jersey, Massachusetts, and Newfoundland. See Drury, Morgan, and Stackpole, Auk, vol. 70, 1953, pp. 364–365.

46. *Anas acuta tzitzihoa* Vieillot is now considered inseparable from the Old World Pintail. The species is thus monotypic and reverts to binomial status. It will stand in the Check-List as *Anas acuta* Linnaeus. See Parkes, Condor, vol. 55, 1953, pp. 275–276.

54. *Histrionicus histrionicus pacificus* Brooks is now considered inseparable from the eastern, nominate, form. The Harlequin Duck thus reverts to binomial status and will stand in the Check-List as *Histrionicus histrionicus* (Linnaeus). See Dickinson, Bull. Mus. Comp. Zool., vol. 109, 1953, p. 139; also Austin and Kuroda, *Ibid.*, 368–369.

98. *Laterallus jamaicensis pygmaeus* (Blackwall) [*Creciscus j. stoddardi* Coale of the Fourth Edition of the A.O.U. Check-List, 1931] is now considered identical with the nominate form and becomes *Laterallus jamaicensis jamaicensis* (Gmelin). See Moreno, Torreia, no. 20, Oct. 12, 1953, pp. 1–8. This replaces the action taken in the Twenty-first Supplement, Auk, vol. 63, 1946, p. 429.

[1] The Twenty-eighth Supplement was published in The Auk, vol. 70, no. 3, July 1953, pp. 359–361.

109. *Scolopax rusticola* Linnaeus, which was considered monotypic in the Twentieth Supplement (Auk, vol. 62, 1940, p. 440), again becomes *Scolopax rusticola rusticola* Linnaeus, because the extralimital race, *S. r. mira* Hartert, is now considered valid. See Austin and Kuroda, Bull. Mus. Comp. Zool., vol. 109, no. 4, Oct., 1953, p. 427; also Hachisuka, Bull. Brit. Ornith. Club., vol. 72, Oct., 1952, pp. 77–81.

122. *Limnodromus griseus hendersoni* Rowan. Inland Dowitcher. [231*a*.] *Limnodromus griseus hendersoni* Rowan, Auk, vol. 49, Jan. 1932, p. 22. (Devil's Lake, Alberta.) Additional subspecies. Breeds from Mackenzie and northern Alberta east to northern Manitoba; south in winter to the Gulf Coast.

122. *Limnodromus griseus caurinus* Pitelka. Alaskan Dowitcher. [231*b*.] *Limnodromus griseus caurinus* Pitelka, Univ. California Publ. Zoöl., vol. 50, March 31, 1950, p. 43. (Yakutat, Alaska.) Additional subspecies. Breeds in southern Alaska from Nushagak Bay east to Yakutat Bay; in migration south along the Pacific coast.

122. *Limnodromus griseus scolopaceus* becomes *Limnodromus scolopaceus*, as it is considered specifically distinct from the races of *Limnodromus griseus*. See Rowan, Auk, vol. 49, 1932, p. 14; Conover, Auk, vol. 58, 1941, pp. 376–378; Pitelka, Univ. California Publ. Zoöl., vol. 50, March 31, 1950, pp. 1–11.

130. *Larus leucopterus* Vieillot, 1820, is a synonym of *Larus hyperboreus* Gunnerus, 1767, so that *Larus leucopterus* of the Check-List becomes *Larus glaucoides* Meyer, from *Larus glaucoides* Meyer, Züsatze und Bericht. zu Meyers und Wolfs Taschenb. deutsch. Vögelk., 1822, p. 197. ("Meere der arktischen Zone, z.B. in Island, zuweilen im Herbst an den Küsten der Ost- und Nordsee" = Iceland.) See Mayaud, Alauda, ser. 3, vol. 6, 1934, pp. 370–375; Salomonsen, Grønlands Fugle, pt. 2, 1951, pp. 310–318. The forms will stand as follows:

Larus glaucoides glaucoides Meyer
Larus glaucoides kumlieni Brewster

146. *Cepphus grylle ultimus* Salomonsen. Short-billed Black Guillemot. [27*b*.] *Cepphus grylle ultimus* Salomonsen, Göteborgs Kungl. Vetenskaps-och Vitterhets-Samhälles Handl. Sjätte Följden, ser. B, band 3, no. 5, 1944, p. 93. (Frozen Strait, Melville Island, District of Franklin, Canada.) Additional subspecies. Melville Island, Ellesmere Island, and northwest Greenland to Baffin Island and northern Labrador.

224. *Aphelocoma coerulescens cana* Pitelka. Eagle Mountain Scrub Jay. [481*h*.] *Aphelocoma californica cana* Pitelka, Univ. California Publ. Zoöl., vol. 50, July 20, 1951, p. 237. (North side of Eagle Mountain, 4,000 feet elevation, Riverside County, California.) Additional form. Resident on Eagle Mountain, eastern Riverside County, California.

286. *Dendroica petechia brewsteri* Grinnell 1903 is considered not separable from *Dendroica petechia morcomi* Coale 1887. See Behle, Condor, vol. 50, 1948, pp. 77–78.

302. *Sturnella neglecta* becomes *Sturnella neglecta neglecta* through recognition of the following subspecies.

302. *Sturnella neglecta confluenta* Rathbun. Pacific Western Meadowlark. [501.1*a*.] *Sturnella neglecta confluenta* Rathbun, Auk, vol. 36, Jan., 1917, p. 68. (Seattle, Washington.) Additional form. From British Columbia south through Washington and western Idaho to Baja California.

330. *Pipilo maculatus* Swainson is now considered conspecific with *Pipilo erythrophthalmus* (Linnaeus). See Sibley, Univ. Calif. Publ. Zoöl., vol. 50, 1950, pp. 116–120, 176; also Dickinson, Bull. Mus. Comp. Zool., vol. 109, 1952, p. 191. The races of the species *erythrophthalmus* will stand in the Check-List as follows:

Pipilo erythrophthalmus erythrophthalmus (Linnaeus)
Pipilo erythrophthalmus canaster Howell
Pipilo erythrophthalmus alleni Coues
Pipilo erythrophthalmus rileyi Koelz
Pipilo erythrophthalmus arcticus (Swainson)
Pipilo erythrophthalmus montanus Swarth
Pipilo erythrophthalmus gaigei Van Tyne and Sutton
Pipilo erythrophthalmus curtatus Grinnell
Pipilo erythrophthalmus oregonus Bell
Pipilo erythrophthalmus falcinellus Swarth
Pipilo erythrophthalmus falcifer McGregor
Pipilo erythrophthalmus megalonyx Baird
Pipilo erythrophthalmus clementae Grinnell
Pipilo erythrophthalmus umbraticola Grinnell and Swarth
Pipilo erythrophthalmus magnirostris Brewster
Pipilo erythrophthalmus consobrinus Ridgway

350. *Spizella atrogularis atrogularis* (Cabanis) is now dropped from the Check-List, because this race is restricted to Mexico, outside the Check-List limits, through recognition of *S. a. evura* Coues (Nineteenth Supplement, Auk, vol. 61, 1944, pp. 463–464).

353. *Passerella iliaca olivacea* Aldrich. Washington Fox Sparrow. [585*r*.] *Passerella iliaca olivacea* Aldrich, Proc. Biol. Soc. Washington, vol. 56, Dec. 8, 1943, p. 163. (Reflection Lake, Mount Rainier, Washington, altitude 4,900 feet.) Additional subspecies. From southern British Columbia (east from the east slopes of the Cascade Mountains to the Blue Mountains of Washington and Oregon) south to northern Idaho and northwestern Montana.

GENERAL NOTES

The Eared Grebe in Massachusetts.—On March 27, 1949, a small grebe diving close to shore off Plum Island, Essex County, Massachusetts, was identified by Mr. Ludlow Griscom as an immature Eared Grebe, the first recorded in the state.

On February 5, 1950, Mr. Griscom found a second immature of this species in Rockport, Cape Ann. On February 25, Mr. Allen Morgan spent six hours collecting this bird, in the process shooting a Black-backed Gull (*Larus marinus*) which attempted to carry off the dead grebe off before he could retrieve it.

This specimen, the first taken on the eastern seaboard, was carefully examined by Mr. James Lee Peters and Mr. Griscom of the Museum of Comparative Zoology, Harvard University. They identified it as *Colymbus caspicus californicus*, since the inner primaries, numbers 5 to 9, had no white at the base. The bird was an immature male; the cheeks were particularly dusky and not sharply demarcated from the crown, and the sex organs were small. The bird is now catalog number 7391 at the Peabody Museum, Salem.

There are subsequent sight records for the state. On October 14 and 21, 1951, an adult Eared Grebe (in winter plumage) with pure white cheeks was seen on the Point Pond, Monomoy, Barnstable County, by Griscom, Richard Bowen, Henry Parker, Snyder, and others, with Horned Grebes (*Colymbus auritus*) for comparison. On March 15, 1952, an immature was seen in Stage Harbor, Chatham, same county, by Allen Morgan, Griscom, and Snyder. On May 17, 1953, Griscom and Mrs. Hervey Elkins found an adult Eared Grebe in full breeding plumage in a backwater of the Mystic River, Everett, Middlesex County.

I am indebted both to Mr. Ludlow Griscom and Mr. Allen Morgan for permission to put these records in print.—Dorothy E. Snyder, *Peabody Museum, Salem, Massachusetts.*

An Unusual Nest of the Ruby-throated Hummingbird (*Archilochus colubris*).—Some years ago, in a publication concerning the hummingbird (New York State Museum Handbook, No. 16, pp. 153–154, 1936) I made some general statements concerning the nest site. These were that the nest is saddled on a limb, usually one which slants slightly downward from the tree. The tree is on the edge of an open area, formed by a brook, road, lake, or the edge of an open field. The nest is sheltered from above by branches or leaves and is not lower than six feet from the ground. Twenty-seven nests I have seen agree with these rules, with only occasional slight exceptions. But the twenty-eighth nest broke practically all the rules.

This nest was discovered at Fairfield, Connecticut, on September 25, 1950. At this time it was unoccupied. It was in the middle of a dense thicket of sumac, bayberry, gray birch, and red cedar. There was no open area. It was not sheltered from above. It was attached to an upright shoot of smooth sumac (*Rhus glabra*) and was at the height of my knee (about 22 inches from the ground). The top of a branch of the sumac had died and was broken off, and an inch below the break a second shoot grew out and turned vertically upward. The nest was supported on the top of the broken stub and bridged across to the other branch, to which it was attached by nesting material—down and spider silk, wrapped around the branch.

The nest was evidently made for an early brood, for it was made of cinnamon fern wool. It was not quite finished, for it was incompletely covered with lichen and looked as though it had never been used.—Aretas A. Saunders, *Canaan, Connecticut.*

A Hybrid between the Little Blue Heron and the Snowy Egret.—On January 30, 1953, the writer saw a heron along the north shore of Lake Okeechobee, Florida, which at first glance appeared to be a Little Blue (*Florida caerulea caerulea*) in the "calico" plumage between immaturity and adulthood. Subsequent observation of it for the ensuing three weeks (it remained in a small pond continually) revealed some interesting and puzzling aspects of both plumage and behavior.

Though largely white, it showed definite bluish patches here and there, but as time passed, these areas did not increase in extent as one might expect them to if the bird was actually in a process of transition from one plumage to another.

The beak and legs were certainly not typical of *F. caerulea*, nor were they characteristic of the Snowy Egret (*Leucophoyx thula*). They fit neither the one or the other but possessed characters of both.

The behavior was a striking variation from that of *F. caerulea* and was practically typical of *L. thula*. Watching it for as long as one wished for four days a week, in the same pond and at ranges of sometimes only a few yards, plumage and behavior were repeatedly checked by William Wylie, the writer's assistant on the Aububon Wildlife Tours and Louis A. Stimson of Miami, who was a visitor in Okeechobee during some of the period.

The bird's feeding tactics were marked with much activity, sudden dashes to and fro, running through shallow water, and darting here and there with the beak. In other words, exactly what a Snowy Egret would be expected to do except that in general appearance the bird resembled a Little Blue Heron.

Upon Stimson's advice, the bird was taken on February 19 and prepared as a skin by the writer. Examination in the hand only strengthened our belief that it must be a hybrid. Though having known both *F. caerulea* and *L. thula* since boyhood, the writer had never heard of hybridization occurring. The skin was therefore sent to the U. S. National Museum and an opinion requested. Reply from Mr. Allen Duvall of that institution contained the following—

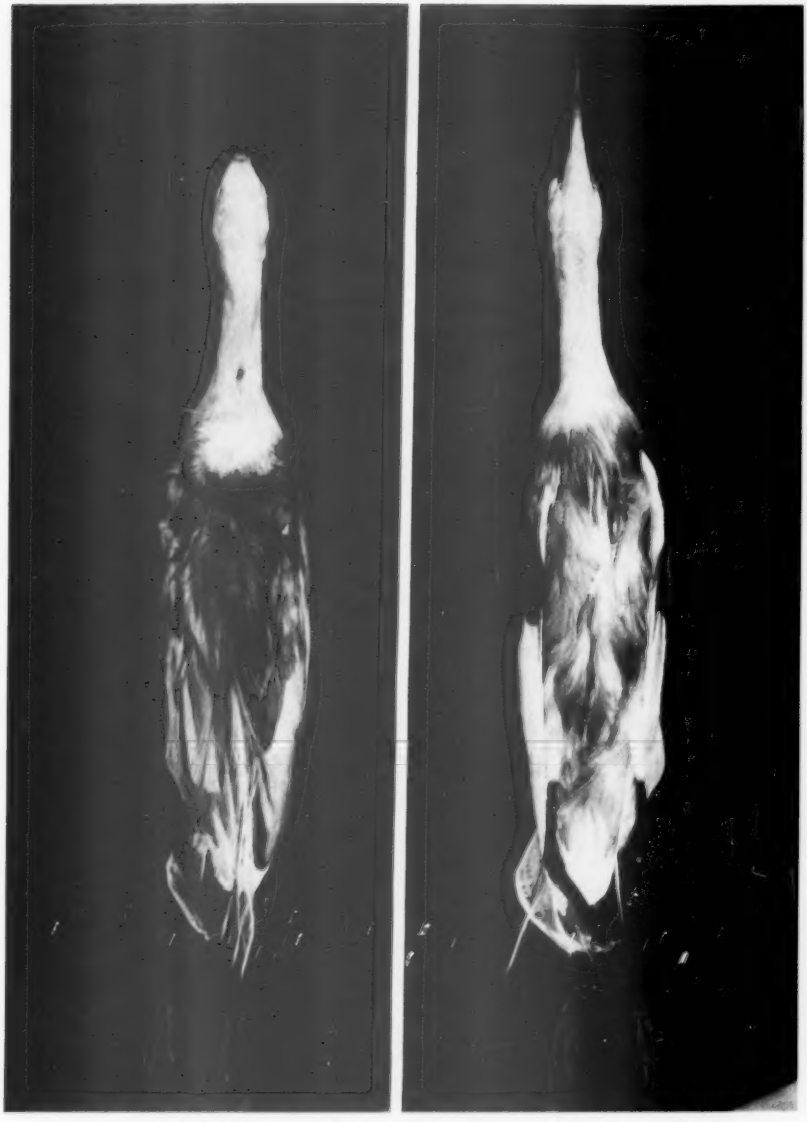
"You are right in your letter that you sent in transmitting a suspected cross between the Little Blue Heron and Snowy Egret for it was just as you surmised. All of us around the Museum examined the specimen and it is our opinion that it is a cross.

"The character which I believe is most diagnostic in indicating the markings of Snowy Egret is the presence of the long, white back plumes which have for each plume most of the structural characters of the Snowy and quite unlike those of the Little Blue."

Mr. Duvall added that he believes the writer correct in thinking this specimen to be the first known instance of such a cross, but that examination of Little Blue Herons in the pied plumage in collections might uncover more hybrids.

The accompanying photographs (plate 23) show the pattern of the plumage which is white except for bluish areas on the back, lower breast, wings, and abdomen. The dorsal plumes are straight (not recurved) and are loosely webbed. The maxilla was black, and the mandible, light blue basally and blackish distally. The lores were bluish, the eyes hazel, and the legs and feet black. The bird was a female. It measured (in inches) as follows: total length, 17.25; wing, 9.45; tail, 3.50; bill, 2.89; and tarsus, 3.62.

The exact locality where the bird was taken was a canal bank on the north shore of Lake Okeechobee, four miles west of the mouth of the Kissimmee River, off State Road 78, Glades County, Florida. The specimen was presented to the United States National Museum, and the photographs are by courtesy of that institution.—ALEXANDER SPRUNT, JR., *The Crescent, Charleston 50, South Carolina.*



SPRUNT: A hybrid between the Little Blue Heron and the Snowy Egret.

Blue Crab as Starvation Food of Oiled American Eiders.—In December 1951, Ludlow Griscom *et al.* (1952, Audubon Field Notes, 6: 55) estimated that the flock of American Eider (*Somateria mollissima dresseri*) wintering off Monomoy Island, Chatham, Massachusetts, had grown to half a million from the four thousand recorded by Hagar in December 1936 (1937, Bull. New England Bird-Life, 1 (3): 2). This great number was apparently finding ample food in the mussel beds of the region until a very severe northeast storm during the early morning of February 18, 1952, caused the breaking up of two welded World War II tankers (the "Fort Mercer" and the "Pendleton") that were standing out to sea in the vicinity of Pollack Rip Lightship off Chatham. Each of these vessels had a capacity of 110,000 barrels of oil, and it was estimated that 150,000 barrels of oil were released in the vicinity of the eiders when the ships broke in two.

Lawrence S. Smith, Refuge Manager for the Monomoy National Wildlife Refuge on the island, counted more than 400 dead and oiled eiders immediately after the storm; probably all of these as well as many more were buried by sand during another gale shortly after. Most of the dead birds were found on the western or bay side of the island, whereas the tankers had released their oil on the seaward side, to the east. Mr. Smith gave the following explanation in a letter. "Even a small spot of oil, saturating the feathers and allowing the cold water to touch the bird's skin would make it cold, hence induce it to leave the water and remain on land. Many eiders flew into the more sheltered waters west of Monomoy and thus came up on the west shore. Others certainly walked across the half mile of dunes to the inside beach, seeking shelter, for many were found dead in bayberry thickets inland." Food to which the eiders were accustomed is not plentiful in the shallow waters off the west shore, and in most cases the eiders, weakened by exposure, did not reenter the water to seek food.

Three weeks after the first storm, Mr. Griscom and a group of ornithologists went down Monomoy Island, which stretches almost due south for ten miles below Chatham, to investigate the effect of the released oil on the eiders. Dead and dying birds were strewn along the beaches of the island, the total count being: 380 American Eider (331 ♂♂ and 49 ♀♀), 4 Common Loon, 4 Gannet, 3 Old Squaw, 5 White-winged Scoter, and 3 Surf Scoter. In addition, they estimated only 2000 eiders alive at sea (all well oiled), plus 500 in Stage Harbor, Chatham. At the Powder Hole, near the southern tip of Monomoy on the west side, six dead eiders were picked up and brought back to the Boston area to be made into study skins. Of these birds, two each had a Blue Crab (*Callinectes sapidus*) stuck in the esophagus. The spines on the extremities of the carapace of a crab three and one half inches across had pierced the wall of the female's throat and ruptured blood vessels in the neck. The gizzard was empty, but whether this bird bled or starved to death can only be conjectured. The crab in the drake's throat had a maximum breadth of three inches and was firmly lodged; the bird's gizzard was empty, and its fat was used up.

As *Callinectes* had not been listed by Cottam (1939, "Food Habits of North American Diving Ducks," U. S. Dept. Agric. Tech. Bull. No. 643: 100), nor by Kortright (1942, "Ducks, Geese and Swans of North America," pp. 307–308) as food of the eider, a search was made on March 26 to determine how many other dead ducks had fed on this crustacean. However not a single Blue Crab could be felt in the throat of 155 ducks handled. Of these birds only 11 were apparently unoiled, while the oiling of the remainder ranged from a single spot to almost complete coverage. At this time, an examination of the stomachs of 15 eiders

revealed gizzards that were empty or contained only a few bits of Horse Mussel (*Brachydontes demissus*) shell, Mud Whelk (*Nassarius obsoletus*) shells, gravel, and/or some oil. Four of the birds with oil in the gizzard were heavily oiled externally; the internal oil may have been ingested in preening. All of these 15 ducks had completely used up their fat supply, as evidenced by the lack of adipose deposits under the skin.

Although no count could be made of the complete death toll of eiders resulting from the oil from the tankers, it is possibly significant that on December 28, 1952, Mr. Griscom estimated only 150,000 birds in the wintering flock off Monomoy, as compared to 500,000 a year previous.—FRANCES L. BURNETT, *Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts, and* DOROTHY E. SNYDER, *Peabody Museum of Salem, Salem, Massachusetts.*

Unusual Feeding Behavior of the Lesser Scaup.—In the last week of February, 1953, I saw groups of six to eight Lesser Scaup (*Aythya affinis*) on four occasions swimming in extremely shallow water among the breakers along the sandy beach at Bull's Island, South Carolina, at times when the tide was falling. On February 25, at approximately mean low water, I saw six scaup squatting with bellies flat on the wet sand feeding vigorously around them. Every so often a wavelet of the receding tide would put them afloat. Usually, however, they would get up and waddle a few steps so as to keep in a zone close to the waters edge where the sand was wettest. The ducks would then again squat on their bellies and stretch their head and neck straight out. Apparently what they were feeding on was abundant along the margin of the receding wavelets, for they never appeared to hunt for food. When I stood within 150 feet, four scaup swam into deeper water. They appeared normally active and healthy. The behavior of the scaup on the beach suggested that the birds were actively feeding, possibly on mollusks (*Donax*) or crustacea (*Emerita*) which would be available in considerable numbers at low water. It is also possible that the ducks were able to obtain their prey by diving as long as the tide had not fallen too low, but when the water left, they continued to feed over the same area by squatting on the bare sand. What the birds actually ate could only have been determined by examination of stomach contents.—LAWRENCE KILHAM, M.D., *8302 Garfield St., Bethesda, Maryland.*

Ruby-throated Hummingbird Feeding at Yellow-bellied Sapsucker Holes. On September 2, 1953, between 1:45 and 2:30 p.m., I observed a Ruby-throated Hummingbird (*Archilochus colubris*) in an activity which I thought was quite extraordinary. I was at Island Lake, 25 miles east northeast of Detroit Lakes, Minnesota. Walking on a road from the north end of the lake to Mud Lake, I noticed an American elm tree with numerous holes in it. The holes were those made by a Yellow-bellied Sapsucker (*Sphyrapicus varius*). I saw a female hummingbird taking sap from the holes. An immature sapsucker was in the vicinity, but the hummingbird kept him away by making sudden darts at him.

I returned about 15 minutes later with my father, Mr. H. D. Smith. The action was still going on. The hummingbird would take sap from the holes, on the wing as they take nectar from flowers. An adult sapsucker came and the hummingbird left for about five minutes but then came back. The adult sapsucker at first made passes at the hummingbird; then both birds fed peacefully about a yard apart. In the meantime, the young sapsucker found more holes farther up the tree and began to feed.—JEROME HAZEN SMITH, *4815 Erskine, Omaha, Nebraska.*

The Dickcissel on the Atlantic Coast of Canada.—In the past three autumns, more records of the Dickcissel (*Spiza americana*) on the Atlantic coast of Canada have come to my attention than all the records for other years combined. Unusual numbers on the north Atlantic coast of the United States have been recorded by Griscom (Audubon Field Notes, 6[1]: 5, 1952) and others. The Canadian records, however, substantially expand the known extent of this remarkable autumn wandering and indicate that considerable numbers were involved.

On October 5, 1950, J. Mitchell Campbell observed three Dickcissels in a clearing on the lower Moisie River, Quebec, 17 river miles [eight air miles] north of its mouth on the north shore of the Gulf of St. Lawrence. These three were seen until October 7, but only two were seen on October 8 and 9. On the latter day, Campbell left the area. An excellent photograph of one of these birds is in the National Museum of Canada. Again, on September 25, 1951, a Dickcissel appeared in the same clearing, and it was promptly collected by Campbell. It is a first-year male now in the National Museum of Canada. These occurrences were recorded by Campbell (Can. Field-Nat., 65[6]: 210, 1951). On October 6, 1952, Campbell observed another Dickcissel in the same clearing in which the 1950 and 1951 observations were made! At that time Campbell was leaving the locality temporarily, and when he returned six days later, he found the bird there dead. Although he airmailed this specimen to the National Museum of Canada, it could not be preserved. However, the incomplete ossification of the skull showed it to be a bird of the year. It is remarkable that in each of the past three years Dickcissels should appear in this remote clearing.

Some 150 miles farther east on the north shore of the Gulf of St. Lawrence at Baie Johan Beetz (Piashti Bay), Quebec, another Dickcissel was collected on September 25, 1951, by Alan G. Loughrey of the Canadian Wildlife Service. The specimen is in the National Museum of Canada. Mr. Loughrey was not there in 1950 or 1952.

In central eastern Newfoundland, at Terra Nova, Tuck (Can. Field-Nat., 66[2]: 68, 1952) closely observed a Dickcissel, apparently an adult male, on November 3, 1951. About an hour later he found another dead on the railroad near by. The wings of the latter are now in the National Museum of Canada. The Moisie River and Baie Johan Beetz birds are the northernmost known occurrences of this species and the Terra Nova ones are the northeasternmost.

Campbell, Loughrey, and Tuck may well have been the only observers in 1951 on the north shore of the Gulf of St. Lawrence and in Newfoundland who would recognize this obscure (in autumn) bird. They all chanced upon Dickcissels that year in the small and widely-separated areas that came under their scrutiny. How many others went unobserved in the vast intervening areas cannot be estimated. Mortality among these northern nomads appeared to be high.

The writer is indebted to Robie W. Tufts for the following heretofore unpublished sight records from Nova Scotia. On November 30, 1952, two Dickcissels appeared at a feeding station in Halifax. One, thought to be a male, disappeared next day. The other became quite tame and was seen until December 7, often with English Sparrows. They were identified by C. K. Allen and Lloyd Duncanson. On December 4, 1952, one was seen feeding with English Sparrows at Liverpool, N. S., by Miss Verna S. Dunlop. She reported this to Mr. Tufts who commented (*in litt.*) that she "gave such a perfect description of the Dickcissel that I had no hesitancy in accepting it at face value."

There are recent sight records also from southwestern New Brunswick. At Machias Seal Island, one was seen on August 20 and 21, 1951, by Glen Woolfenden

and recorded by Squires in 'The Birds of New Brunswick' (The New Brunswick Museum, Monographic Ser. 4, p. 134, 1952). Two, perhaps the same, were observed there on August 31, 1951, by Arnett and Corson (Records of New England Birds, 7[8]: 161, 1951). At St. Andrews, N. B., Miss H. W. Mac Coubrey reported one, apparently a male, on September 21, 1952, according to Squires (Nature News, 3[5]: 2, 1952).

Rand (Auk, 46 [2]: 247, 1929) summarized the Atlantic coastal records from northeastern United States and eastern Canada through 1928. To his summary, the following Canadian records may be added. Dwight (Auk, 20 [4]: 440, 1903) recorded a young male collected on September 13, 1902, on Sable Island, Nova Scotia. Smith (Auk, 55 [3]: 549–550, 1938) reported a specimen killed by a car at North Sydney, N. S., on December 3, 1929. Ball (Can. Field-Nat., 57[1]: 4, 1943) carefully identified one, apparently an immature male, near Cape Gaspé, Quebec, on October 18, 1940.—W. Earl Godfrey, *National Museum of Canada, Ottawa, Ontario.*

Survival Records of Young Feral Pigeons.—The object of this note is to present some recent data on the survival of the feral domestic pigeon (*Columba livia*) from egg to fledgling, utilizing the terms recommended by Davis (Auk, 69: 316–320, 1952).

Although we are well aware of the fact that the pigeon's clutch usually consists of but two eggs, we need to know the rate of recruitment of young pigeons into a flock. Recently it has been shown (Davis and Schein, Anat. Rec., 113: 549, 1952) that pigeon reproduction is not restricted to one short season; indeed, newly laid eggs were found in every month of the year. Therefore, the potential recruitment of young is very high.

In order to gain some idea of the actual magnitude of this recruitment, it was necessary to observe a series of nests from egg-laying to fledging of young and to determine the probabilities of hatching and fledging of the eggs. This was accomplished on two widely separated flocks of pigeons: one in the heart of the city of Baltimore, Maryland, and the other in the vicinity of the Johns Hopkins Hospital, approximately two miles away from the downtown flock.

The downtown flock of about 75 birds centered their activities about a church steeple which was used for both nesting and roosting. The steeple was a tall, tapering brick spire, with a base and seven progressively smaller wooden platforms at 20- to 30-foot intervals within the spire. All but the first platform were well illuminated through the many windows and openings in the steeple, and all but the base, first, second, and fourth platforms were directly accessible to the birds from the outside. The pigeons roosted on the platforms and ladders within the steeple, and on the windows and ornamental carvings and ledges on the outside of the steeple. Nests were usually located on the platforms and occasionally in an opening within the wall.

The base of the steeple, approximately two stories above ground level, was illuminated by a large window in which the glass was completely intact, thus affording no access to the outside at this level. The floor was covered with two to three feet of litter, consisting of skeletons of both pigeons and starlings, egg shells, old nesting material, and accumulated pebbles and droppings. Only two nests were found on this level, and both were abandoned before the eggs could hatch. In fact, the only birds which I saw on this level were nestlings and young fledglings which had fallen down from an upper level and were unable to escape.

The first platform was completely dark and piled with litter much as was the base; no nesting or roosting was observed on this platform. The second platform was fairly well illuminated from above, although there was no window at this level. Many birds frequented this platform, and 34.3 per cent of the total observed nestings occurred at this level. The third platform was well illuminated and was open to the outside on the south side. This provided the major means of ingress and egress for the birds, and consequently this platform was much used as a roost and 18.5 per cent of the total observed nesting occurred at this level. The fourth platform was fairly well illuminated but had no direct access to the outside. This level accounted for 32.4 per cent of the total observed nestings. Although the fifth, sixth, and seventh platforms were very well illuminated and freely accessible on all four sides, nesting activity dropped off sharply to 7.4, 5.6, and 0 per cent, respectively, on these platforms. There were few indications of roosting on the sixth platform and none on the seventh.

The flock around the hospital grounds varied from 75–150 birds at different times of the year. These birds roosted on the ledges around the buildings and nested in small window balconies, drain gutters, and ventilating towers atop the hospital building. Eleven sites were selected from which to make weekly observations. These sites encompassed most of the nesting areas on the hospital grounds and varied in areal size from one small window balcony to an entire roof with surrounding ledges.

Of all the observation sites, one deserves further mention. This site was the inside of a ventilating tower atop one of the buildings of the hospital group. It was about eight feet in diameter and about fifteen feet high; the uppermost seven feet were louvred. The base was a giant fan which was not used, and the top was a dome set on a platform with a large hole in it. Birds entered the tower through the louvres and roosted on them, while nesting occurred between the incomplete platform and the dome. Nestlings therefore had the benefit of warm air coming up from the building through the ventilating ducts and collecting under the dome. In fact, a ten-month check of air temperatures at all of the observation sites disclosed the fact that only at this site was there no correlation between the outside air temperature and the temperature near the nests. All other sites were at or near outside temperatures, while this site was usually considerably warmer during the winter months.

The church stations were visited weekly from January 11, 1951, until June 23, 1951, while the hospital areas were visited weekly from February 12, 1951, until May 24, 1952. At each visit the fate of the previous week's nests was recorded, and new nests were assigned a code number and plotted descriptively so the progress of each could be followed in the ensuing weeks. Eggs that did not hatch after 3 consecutive weeks of observations were considered abandoned, since the incubation period of pigeon's eggs is approximately 18 to 20 days (Whitman, C. O., Posthumous Works, Vol. III, 1919). Fledging usually occurred about 45 to 50 days after the finding of the nest, and young missing from the nest after 45 days of observation were considered to have fledged successfully. Those missing from the nests after less than 45 days of observation were considered to have died, and in most cases a quick search of the area uncovered the dead nestling.

In the church flock, 85 of 152 eggs hatched, and 47 of these subsequently fledged, giving a probability of eggs hatching of 0.559 and of eggs fledging of 0.309. The probability that nestlings would fledge was 0.553. In the hospital flock, 149 of 293 eggs hatched, while 83 subsequently fledged, giving a probability of eggs hatching

of 0.509, and of eggs fledging of 0.283. In this group, the probability that nestlings would fledge was 0.557.

The recruitment probabilities are strikingly similar in the two flocks, even though one was observed only during the spring months whereas the other was observed for more than a year. Indeed, a test of the difference between the probabilities of hatching of the two flocks showed the difference to be not statistically significant.

It has been mentioned above that the ventilating tower station on the hospital grounds was not subject to the extremes of outdoor temperatures, and it might be assumed that this would have an effect on the survival probabilities at this station. However, a tally of the nests at this station showed that of 111 eggs, 59 hatched and 33 subsequently fledged, which give probabilities of hatching and fledging of 0.531 and 0.297 respectively, very close to those mentioned above.

Since the two flocks were by and large very similar, the data were combined for the following estimate of survival of young pigeons in Baltimore, Maryland:

Number of nests in survey	234
Number of eggs	445
Number of eggs hatching	234
Number of nestlings subsequently fledging	130
Probability that eggs would hatch	0.526
Probability that eggs would survive to fledge	0.292
Probability that nestlings would fledge	0.556

It is hoped that the above information will add to the fund of basic information needed to analyse more intelligently the factors of survival and mortality in birds. The author is indebted to the staff of the Vertebrate Ecology Division of the Johns Hopkins School of Hygiene and Public Health, and in particular to Mr. Phillip Ottenritter, for help in making the observations from December 29, 1951, to May 24, 1952.—MARTIN W. SCHEIN, *U. S. Department of Agriculture, Jeanerette, Louisiana.*

A Captive Gannet.—On September 22, 1952, my son Stephen brought home a Gannet (*Moris bassana*) that he had found unable to fly and swimming just beyond the surf-line of Galveston Island. It was one of the few examples of this species ever secured in Texas. I kept it in my garage for three weeks and then released it on Galveston Island. Since observations on Gannets at close quarters are not common, the following notes may be of interest:

Parasites.—The bird was heavily infested with lice. I dusted it with a pyrethrum-base insecticide, and the lice fell off in great numbers within a few minutes. No louse was seen on it afterward. Mr. John Simmons, Department of Biology, the Rice Institute, identified some I collected as *Pectinopygus bassani* (17 specimens) and *Menopon* sp. (8 specimens).

Plumage and molt.—The plumage succession of young Gannets is very complex, and I did not find the plumage phase of this bird described in any of the usual authorities. The back and wings were entirely dark brown, as were the tail feathers, except at the base. The underparts were dirty white except for a broad, indistinct dark band around the lower neck or upper breast. The top of the head was white flecked with black. The tertials on both wings had evidently been molted and not replaced, and the very distinct gap left in the wing surface next the body probably accounted for the bird's inability to fly. These tertials had grown back almost to normal length within three weeks. The iris (which also changes color with age) was gray-blue.

Feeding behavior.—For the first three or four days it was force-fed with strips of codfish or ocean-perch steaks bought frozen and thawed out. The bird resisted

violently and would cast the meat from its beak unless it was shoved far back in the throat. Once, on the fourth day, when I had not had time to feed it in the morning and it had been without food for eighteen hours, it voluntarily seized from my hand two strips of codfish meat. The next day I bought frozen whiting, scaled and headless, but otherwise whole, with fins and tail still attached. Having thawed them out in warm water, I held one up before the Gannet. Apparently it immediately recognized the object as a fish, for it began squawking excitedly, flapping its wings, opening its beak wide, and trying to seize the fish from my hand. It seems incredible that a fish presented in such circumstances could be recognized, but no other interpretation seems possible. The bird would still refuse codfish strips, and when a whiting was sliced in two longitudinally, the bird would usually refuse it; or if in haste it did seize the piece, it would sling it from its beak. The bird would swallow fish two and one-half inches in diameter and a foot long; they usually went down head-first, but when the bird was almost replete, it would flip the fish around and swallow it down tail-first. After eating, the bird would always stand and shiver a few minutes, and drops of moisture would drool from the tip of the beak. The bird was offered both fresh and salt water in a pan, and the beak was forced into it, but the water was slung off violently. After the first few days water was no longer offered; the bird drank not a drop in three weeks.

Intelligence.—The bird displayed an unexpected capacity to learn. Within ten days it was recognizing me as its feeder, and would beg (with half-opened, flapping wings, neck extended, and open beak) from me, but never from other members of the family. When it was not taking food from my hand, it would savagely attack me or any other person who came within three or four feet, and on more than one occasion it inflicted painful wounds. But if several people came at once to observe the bird, it always showed fear and tried to retreat. The garage where the bird was kept is connected to the house, with a doorway leading from a pantry to the garage. I usually fed the bird through this doorway; and at any time of the day or night when I rattled the lock of this door, I could hear the bird beyond the door shuffling fast across the newspapers spread on the floor. Clearly it had learned to associate the rattling of the lock with food. It quickly made another association. In order to move or handle the bird without damage to myself, I would drop over its head a cloth that I kept handy for that purpose. Within a week the bird learned to fear the cloth and to retreat whenever I approached with it. Without the cloth, I was attacked if I came near without food. Apparently the bird could see in the dark better than I could; but when I switched on the bright electric lamp in the garage, the bird would stand dazed for about five seconds before it would seize a proffered fish.

Behavior on release.—When set down on the beach near the surf, the bird paid no attention to the water but continued to fight the three of us who had released it. When it was finally shoved into the water, it slowly waded out until it was swimming. It then fluffed itself, flapped its wings, threw spray on itself with its wings, and repeatedly dipped its whole head and neck under the water (but it still did not seem to drink). After a few minutes it tried to fly; but unfortunately a dead calm prevailed that day, and the bird could never become airborne. It swam out about five hundred yards into the Gulf and remained there until we left, half an hour later. I looked for it carefully the next week but never saw it again.—GEORGE G. WILLIAMS, *The Rice Institute, Houston, Texas.*

A Large Heron and Egret Colony on the Stillwater Wildlife Management Area, Nevada.—Conspicuous among the members of the avian fauna that utilize the Stillwater Wildlife Management Area for nesting are the herons, egrets, and ibis which congregate in large numbers in the marsh. One very large colony consisting of the nests of these birds was found in 1950. Three smaller colonies, occupied by ibis or herons, were also present. The principal colony seemed unusually large in view of its inland location, containing an estimated 1,191 nests.

Nests in the largest colony included those of Black-crowned Night Herons (*Nycticorax nycticorax*), Great Blue Herons (*Ardea herodias*), Snowy Egrets (*Leucophoyx thula*), American Egrets (*Casmerodius albus*), and White-faced Glossy Ibis (*Plegadis mexicana*). Two of the smaller colonies contained ibis nests, and the third, Great Blue Heron nests.

All of the colonies were found in or adjacent to the Stillwater Marsh which is located 14 miles northeast of Fallon in the Lahontan Valley of west-central Nevada. This marsh lies on the eastern edge of the recently established Stillwater Wildlife Management Area.

The marsh is a waste-water sump, one of several receiving drain water from the extensive irrigation system supplied by the Carson and Truckee rivers. Originally the marsh was maintained only by run-off in the spring of the year through the Stillwater Slough. This produced violent fluctuations, with extremely high water in the spring and drought during the rest of the year. Today, the marsh obtains nearly all of its water from ditches which drain the irrigated lands and, consequently, receives its greatest inflow in the hottest months when the rate of evaporation is highest. This change has effectively increased the size of the marsh and has tended to stabilize water levels so that all but a few of the shallower, outlying ponds have permanent water.

Accompanying the stabilization of water levels have come improvements in both food and cover which benefit marsh birds particularly. Fish, frogs, and aquatic invertebrates have become permanent members of the fauna, while extensive new areas of emergent plant growth have increased the available nesting cover.

At the present time, there are approximately 24,000 acres within the marsh area. Water, flowing north and east through several drainage ditches, spreads out into a series of marsh ponds varying from two to four feet or more in depth and characterized by wide margins of cattail (*Typha angustifolia* L. and *T. domingensis* Persoon). North of these ponds the marsh is more shallow. Cattail still predominates along the central channels, but hardstem bulrush (*Scirpus acutus* Muhl.) makes an extensive growth in some of the marginal ponds. Beyond this median zone, the water spreads out in a shallow basin formed by an arm of the Carson Sink. The upper limits of this flooded area support a growth of alkali bulrush (*Scirpus paludosus* A. Nels.). The lower end, which is known locally as the "Big Water," fluctuates too greatly for emergent plants but produces wigeon grass (*Ruppia maritima* L.) in years when sufficient water is available. Other important submergents in the marsh are sago pondweed (*Potamogeton pectinatus* L.) and muskgrass (*Chara* sp.). Emergent vegetation is well interspersed with open water and amounts to some 10,000 acres or slightly more than 40 per cent of the total marsh acreage. Aquatic growth occurs in about half of the open water present.

Offering such a diversity of conditions, the marsh attracts a large and varied assortment of birds. Thousands of waterfowl and shorebirds use the area on migration with many of these remaining as summer residents to breed.

The largest colony is located in an 18-acre stand of hard-stem bulrush which is entirely surrounded by cattail growth. This stand of bulrush is in the north-central

part of the marsh. It is isolated from the mainland but is in close proximity to two of the interior islands. At the south end, a three-acre portion is separated from the main body by a narrow band of cattail. Water depth in the bulrush varies from 18 inches to 3 feet. The bulrush makes an exceedingly rank, dense, growth with culms extending 6 to 8 feet above the surface of the water. The stand is broken in the center, however, by numerous interconnected small pools and channels. It was along the periphery of these interior openings that most nesting occurred.

The colony was first seen from the air on April 24, 1950, by Marshall while making a waterfowl census from an airplane. A preliminary investigation was made on the ground on April 27, followed by a more detailed survey on April 29 by Marshall,

TABLE 1

NEST CENSUS OF NORTH END OF COLONY, APRIL 29, 1950

Species	*Nests with eggs only*	*Nests with eggs and young*	*Nests with young only*	*Nests empty or abandoned by young*	*Total nests seen*	*Total nests estimated*
Black-crowned Night Heron	192	64	89	78	423	564
Great Blue Heron	43	13	15	2	73	77
Snowy Egret	60	1	0	2	63	90
American Egret	3	0	0	0	3	4
White-faced Glossy Ibis	1	0	0	0	1	4

Giles, and Fred Wright, Waterfowl Technician of the Nevada State Fish and Game Commission. A part of the colony, located in the isolated southern portion of the bulrush growth, was overlooked on these first two visits and was not checked until May 19.

The colony was surveyed by wading its length, one observer going through the middle and the other two covering the sides. Each man took data on all nests found. Information tabulated included the species using the nest, number of eggs and/or young, and type of nest construction. The presence of food items was also noted. Some of the corners of the rookery were not thoroughly examined. This was not done for lack of time and the need for minimizing disturbance.

The nests of some species were easier to find than those of others. A considerable number of nests was concealed by the bulrushes and therefore overlooked. The Snowy Egrets, in particular, tended to build their nests a short distance back in the vegetation. Most of the large and conspicuous Great Blue Heron nests were seen. A large percentage of the night heron nests were also found, though allowance had to be made for some of the peripheral marsh openings which were not thoroughly examined.

We feel that it is worthwhile to make an estimate of the total number of nests. Such an estimate will better illustrate the actual size of this colony than could the nest count alone. By comparing the number of birds flushed ahead of us with the number of nests seen and by extending our counts from areas searched carefully to other parts of the colony more hastily inspected, but having similar proportions of plainly visible nests, we were able to arrive at total figures which are indicative if not precise.

The final columns in tables 1 and 2 show our estimate of total number of nests present. The combined total by species for both segments of the colony is:

Black-crowned Night Heron, 867; Great Blue Heron, 142; Snowy Egret, 168; American Egret, 6; and White-faced Glossy Ibis, 8. It is possible that more ibis nested later in the season. At the time the north portion of the colony was examined ibis were still migrating.

On April 29, nesting was well underway, that of the Black-crowned Night Herons being the most advanced with 36 per cent of the nests seen containing young birds. A few young in the flapper, or early flight, stage were noted, and many others were old enough to sneak away from the nest to hide in the emergent growth as we approached. It was frequently difficult or impossible to assign these more active birds to definite nests, and this in large part, accounts for the high incidence of empty nests (18 per cent).

TABLE 2

NEST CENSUS OF SOUTH END OF COLONY, MAY 19, 1950

Species	*Nests with eggs only*	*Nests with eggs and young*	*Nests with young only*	*Nests empty or abandoned by young*	*Total nests seen*	*Total nests estimated*
Black-crowned Night Heron	12	5	39	126	182	303
Great Blue Heron	5	3	40	1	49	65
Snowy Egret	17	4	16	2	39	78
American Egret	1	0	0	0	1	2
White-faced Glossy Ibis	1	0	1	0	2	4

The clutches of the Great Blue Herons were nearly all complete, and hatching had occurred or was in progress in 38 per cent of the nests. Snowy Egrets had started laying somewhat later. Two nests were still under construction, and young were noted in only one nest. Only 3 American Egret nests and one ibis nest were seen. Each contained eggs which were probably being incubated. The data in table 2 were obtained on May 19 from the smaller, south end of the colony and provide a record of nesting progress. At the time of this visit many of the young night herons were flying, and a considerable number of Great Blue Herons, though still at the nest, were fully feathered.

The principal material used in nest construction was hardstem bulrush; all night heron nests, except six, and all egret and ibis nests were formed of this material. The six exceptional nests were located in clumps of cattail and were composed principally of the leaves of this plant. The Great Blue Herons reinforced their nests with the woody branches of burro-weed (*Allenrolfea occidentalis* Wats.) and of sea-blite (*Suaeda torreyana* S. Wats.) but built upon a foundation of hardstem bulrush.

The young birds observed did not regurgitate the remains of their previous meal as is commonly noted among pelicans and cormorants, hence only a few records of their food were obtained. On two Great Blue Heron nests and one night heron nest dead carp (*Cyprinus carpio* L.) were found. These fish measured from 7 to 10 inches in length and were present probably because they were too large to be eaten. In fact, one young night heron, found floating in the water with a carp of similar size protruding from its mouth, quite evidently had been able neither to swallow nor to disgorge the fish and died as a result. Since carp are the most abundant and readily obtainable fish in the marsh, they can be expected to provide a major source of food.

The colony was apparently a new one. No evidence of previous nesting was found. Because of its large size it would seem that the use of this area represents a change in nesting sites rather than a new concentration of breeding birds. No other colony of this size has been recorded from any of the several marshes in the Lahontan Valley, so its origin is unknown. Possibly the birds moved from another location within the Stillwater area. Extensive stands of hardstem bulrush occur in the northwestern part of the marsh offering possible locations. Parts of this bulrush growth burned during the early spring prior to the start of nesting, and the fire removed the mat of dead material essential to nest construction.

Besides the large colony there were other nesting areas of much smaller size. Two ibis colonies were found: one, containing 25 nests, was in a patch of hardstem bulrush within the zone of alkali bulrush near the lower end of the marsh; the second, with 11 nests, also in hardstem bulrush, was on the Canvasback Gun Club, a privately owned tract comprising the southwestern corner of the marsh. This latter colony was unique in that the nests were constructed in an area of dense growth away from open water.

Immediately to the south of the Stillwater Marsh, on the Freeman Ranch, Great Blue Herons nested in a strip of large cottonwood trees (*Populus fremontii* Wats.) growing beside an irrigation ditch. In 1949, these trees contained 85 nests. Originally we thought that some of these birds might have deserted to join the nesting colony in the big marsh, but such was not the case. The number of nests in the cottonwoods increased to 106 in 1950. Further evidence concerning the type of food eaten was obtained from one of these blue heron nests. This nest held 10 carp measuring from 10 to 12 inches in length.—LeRoy W. Giles and David B. Marshall, *U. S. Fish and Wildlife Service, Fallon, Nevada.*

Nest of Barn Swallow Saddled on Wire.—In eastern Ohio, Barn Swallows (*Hirundo rustica*) normally plaster their nests to the sides of rafters and joists or place the nests on the tops of girders in barns. A notable exception to this practice was found on June 19, 1941, in the barn of C. A. Bieber near Youngstown, Ohio. This nest was found saddled on the top of a single small wire and had no other support than that furnished to it by the wire.

The wire to which the nest was attached carried an electric current and was insulated. This wire with the insulation was five millimeters in diameter, and its surface was quite smooth. The wire extended between two adjacent joists 60 centimeters apart, and it was attached to each joist. It was not stretched tightly but could be moved four millimeters from side to side as measured at a point midway between the joists. This condition was responsible for a significant amount of swaying of the nest each time the birds alighted on it. The nest was attached to the wire about five centimeters nearer to one joist than to the other.

The top of the nest was circular in outline. The nest extended 52 millimeters above the wire and 38 millimeters below at the farthest point. It was somewhat less bulky than other nearby nests which were plastered on the sides of the joists. Nearby, there were ample supports of the types usually chosen and where the nest might have been placed. Fourteen additional pairs of Barn Swallows occupied the barn at the same time.

Four eggs were laid, but after incubation had been in progress for about a week, the nest broke loose from the wire and fell to the floor.—Paul A. Stewart, *Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.*

The Occurrence of *Pandion haliaetus* in Surinam.—In Surinam, the Fish-hawk is a regular migrant from the north. It frequents the mouths of the big rivers, the muddy coastal sea, and the lagoons behind the coast line; it also follows the rivers far upstream. It is difficult to state when it arrives in this country on its autumn migration and when it leaves again for its summer haunts, as I have records from all months of the year. I presume that the birds I observed at several widely separated localities during the northern summer were immatures.

My records of these wandering birds are: April 13, 1949, Armina Rapids, Maroni River (about 150 kms. from its mouth); April 20, 1953, mouth of the Nickerie River; May 5, 1953, coast at Coronie; May 16 and 24, 1953, mouth of the Coppename River; June 15, 1953, coast near Nickerie; July 10 and 11, 1947, mouth of the Coppename River; July 30, 1947, Republiek; August 17, 1947, lagoons near Nickerie; August 20, 1952, Republiek; August 22, 1953, Corentyne River.

From September until April, the Fish Hawk is a regular visitor. I have seen it on all our big rivers, and nearly every year I watch it fishing on the Surinam River in front of my home near Paramaribo. Sometimes several birds fish together in favorable localities: September 10, 1947, two on the Saramacca River; November 2, 1952, two near Coronie; November 30, 1947, one on the Commewijne River, and several birds on the lagoons near Matapica Creek in the same district; December 20 and 21, 1946, three at the lagoons near Nickerie; March 15, 1947, three at the mouth of the Coppename River and one on the Saramacca River.—F. Haverschmidt, *P. O. Box 644, Paramaribo, Surinam.*

***Rhytipterna immunda* (Sclater and Salvin) in Surinam.**—Hellmayr (Catalogue of birds of the Americas. Field Mus. Nat. Hist. Zool. Vol. 13, pt. 6, 1929, p. 154) stated that *Rhytipterna immunda* was known only from the two original specimens in the British Museum, supposed to have been collected at Oyapock, Cayenne. The locality is, according to this authority, perhaps open to doubt, though arguments for this opinion are not given.

Zimmer (Studies on Peruvian birds No. 23. Amer. Mus. Nov. No. 893, 1936: 12–13) had only six specimens at hand, four from Yavanari, Rio Negro, Brazil, one from Santarem on the south bank of the Amazon, Brazil, and one from the Rio Huaynia, junction of the Cassiquiare, Venezuela.

Furthermore, Gyldenstolpe (The bird fauna of Rio Juruá in Western Brazil. Kungl. Svenska Vetensk. Akad. Handl. 22, 1945: 210) mentions two specimens, one from Igarapex Aniba on the north side of the Middle Amazon and one from Manáos. A search in the Zoological Record revealed no other records of this rare bird.

Zimmer (*loc. cit.*) further remarks that the extreme rarity of this species and the fact that its supposed locality of origin is open to some doubt, makes the discovery of this bird in a new region of particular interest. With reference to this remark I am glad to be able to report that *Rhytipterna immunda* also occurs in Surinam (Dutch Guiana), where I collected three specimens. On August 31, 1952, I collected a bird of undeterminable sex (coll. No. 1147) near Zanderij (about 50 kms. due south of Paramaribo) and on September 7, 1952, a male (coll. No. 1160) in the same locality. Both specimens were identified by Zimmer and are now in the American Museum of Natural History at New York. A third specimen, a male with greatly enlarged testes, was taken September 17, 1953, at the same locality. It is now in the University of Michigan Museum of Zoology.

The habitat where I found these birds is a large sandy savanna, dotted over by rather large bushes and surrounded on all sides by forest. My attention to the

bird shot on August 31 was drawn to it by its rather finch-like note, which I did not know. The first two specimens were shot at a distance of about two kilometers from each other. Now that *Rhytipterna immunda* has been found in Surinam, the doubt about its locality of origin in Cayenne seems considerably lessened.— F. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam.*

The Occurrence of *Muscivora tyrannus* in Surinam.—In Surinam, the Fork-tailed Flycatcher is one of the most striking migrants from the south. Though common, and even numerous in certain periods of the year, its movements are erratic and are difficult to understand, as the birds suddenly appear either singly or in flocks at a certain spot, staying one or a few days, to disappear again. Then it may take weeks before other birds arrive. They never seem to remain for a long time at a single locality, so I am not sure whether true "wintering" occurs or whether all birds seen are only passing through.

According to Zimmer (Studies on Peruvian birds XXVII. American Museum Novitates No. 962, 1937, p. 3), these birds breed in Argentina and Paraguay in the summer (from November to January). The population then migrates northward, probably beginning in January and continuing through February, while the southern movement appears to be in full swing from the northernmost localities in September and October.

In Surinam, my first record of its arrival from the south is February 26, 1948. I have only a single record from March: March 6, 1949. Even in April, the birds are still scarce (4 records): April 7, 1946; April 24, 1949; April 26 and 27, 1947. In May, the birds become more numerous (7 records): May 7, 1953; May 8, 1951; May 9, 1952; May 14, 16, 17, and 21, 1946. From June onwards, observations are more frequent, reaching their maximum in July, August, and September when sometimes flocks are seen: June 14, 1947, 50; August 3, 1952, 35; August 10, 1947, 100; September 15, 1948, 23; September 18, 1952, 30.

In October, there is a sharp drop in numbers, and from then on, only a few stragglers are observed. I have six records from October: October 8, 1953; October 12, 1947; October 21, 1953; October 22, 1948; October 28, 1947; and October 29, 1950. There are three records from November: November 2, 1952; November 6, 1953; and November 12, 1946. My latest dates are December 17, 1953, and December 18, 1951.

I have records from all months of the year except January. It is difficult to state when the northward migration stops and the southward movement starts again, but I should say that southward migration may start in July and is in full swing in August and September as the following observations suggest. From August 13 to 22, 1947, I daily observed in the late afternoon, starting at about 5:30 p.m., a number of birds crossing the Nickerie River at Nieuw Nickerie in a southeasterly direction in small groups of 50 to 100 birds. However, it may be possible that these birds were only on their way to a communal evening roost, though the next morning a return movement in the opposite direction was never seen. On the other hand, in the same period of the year on August 12 and 16, 1948, small groups were seen crossing the Surinam River at Paramaribo in the afternoon flying in the opposite direction to the north-northwest.

My observations agree well with those of Young (Ibis, 1929, pp. 230–233) from the neighboring coast of British Guiana, who even mentions one record from January 1924 (at the end of the month), and who states that in July the return migration begins, is most marked in August, and ceases in September.—F. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam.*

The Barn Swallow in Surinam.—In Surinam, *Hirundo rustica erythrogaster* is a common visitor from the north. It is, however, rather local as it is never seen in forests or wooded areas but wholly confined to wide, open spaces such as rice fields, savannas, lagoons, and the mouths of the big rivers.

My first record of its arrival from the north is August 22, 1953, three birds at Nickerie, while four were seen along the coast in the same district on August 23, 1953. Heavy migration takes place in the first half of September. On September 12 and 14, 1946, and again on September 13, 1947, numerous birds crossed the mouth of the Coppename River and followed the Saramacca River upstream in a southeasterly direction. Migration continues during October: on October 2, 1949, a strong migration took place toward the southeast over the savanna at Zanderij and to a lesser extent on October 9 and 30, 1949. It lasts even far into November: on November 12, 1952, 16 birds were seen following the coast at Coronie, as were five on November 20, 1949, over the savanna at Zanderij. On both dates, the birds flew in a southeasterly direction.

During December, January, February, and March great numbers assemble in the open spaces already mentioned: on December 20 and 21, 1946, a great many birds were hawking over the lagoons at Nickerie. When I arrived here about one hour before sunset on December 13, 1952, a great number of swallows was flying low over the surface of the water, taking a kind of communal bath, splashing in flight into the water, so that the drops spattered up into the air. Later on they all assembled in a huge flock in a fully-leaved tree in the middle of the lagoon, where they spent the night.

During these months many birds hawk around the sheds and barns in the vast rice fields in the same district. It is difficult to state when the northward movement starts again, as the birds are present during all the intervening months, but spring migration lasts into the latter part of April, as great numbers were present in the rice fields at Nickerie until April 20, 1953. A few stragglers are present in May and even in June. My latest records are: May 4, 1953, one bird above the rice fields at Coronie; May 11, 1946, one above the Surinam River at Paramaribo; May 24, 1953, one at the mouth of the Coppename River; June 5, 1948, one above the Boromoffo Creek at the place where it enters the Coppename River. In the interior of the country it seems that the birds follow the course of the big rivers during migration, as on March 24, 1953, six birds were seen flying downstream along the upper Surinam River between Kabel and Brokopondo; on March 25, more birds were seen further downstream.

My records agree well with the observations by Young (Ibis, 1929: 235) from the neighboring coast of British Guiana, who observed the first migrants from the north in the latter part of August.—F. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam.*

***Conirostrum bicolor* Parasitized by *Molothrus bonariensis* in Surinam.**—Hellmayr (Field Mus. Nat. Hist. Publ. 347, Zool. Ser. vol. 13, 1935, p. 319) includes Surinam in the range of *Conirostrum bicolor* on evidence of the Penard brothers (Vogels van Guyana, 2, 1910, p. 475), though he mentions no specimens nor localities.

In Surinam, as elsewhere in its range, *Conirostrum bicolor* is confined to the tidal mangroves (*Avicennia nitida*) bordering the seacoast. I found this species particularly common in this habitat in the Nickerie District in the west of the country, where I collected four specimens near the mouth of the Corentyne River on February 27 and 28, 1953. Cowbirds (*Molothrus bonariensis*) are also common in these mangroves.

On February 28, 1953, I observed a fledgling cowbird sitting on a branch of an *Avicennia* tree and uttering constantly its chirrupping, begging call. After a short while a *Conirostrum* approached with a small insect which it fed to the cowbird. I collected the cowbird (coll. no. 1326, Leiden Museum).

This is the second case of a cowbird parasitizing *Conirostrum bicolor*; the first one being reported by Friedmann (Auk 55, 1938, p. 44) on authority of Smooker who found, on July 18, 1932, in the Caroni Swamp on Trinidad, a nest of *Conirostrum* with two eggs of a Cowbird, but none of the host. However, this record seems not wholly satisfactory, if we compare it with the remarks by Belcher and Smooker (Ibis 1937, p. 520) on the nesting of *Conirostrum bicolor* in which some doubt is left by the authors themselves about the identity of the nests they attributed to this species.—F. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam.*

***Quiscalus lugubris fortirostris* in Surinam.**—On November 27, 1952, I was walking along the sea coast near Galibi (Surinam), just west of the mouth of the Maroni River, when suddenly a flock of five birds alighted in some dead shrubbery on the beach. The birds seemed exhausted and immediately gave me the impression of migrants having just arrived from the sea. For this reason, I collected two of them which proved to be *Quiscalus lugubris*. I sent both specimens (♀ ♀ coll. nrs. 1255 and 1256) to the American Museum of Natural History at New York, and my suspicion that they might not belong to our local breeding race was substantiated as Dr. Zimmer informed me (*in litt.*) that both of them were *Q. l. fortirostris*, the race inhabiting Barbados.

What is even more interesting is that there is in the same institution another specimen of *fortirostris* from Surinam in the Penard Collection, taken on October 3, 1921, near Diana Creek (as far as the label could be deciphered, but a locality unknown to me in Surinam).

Dr. Zimmer agrees that the circumstances attending the appearance of the small flock at Galibi from which I collected two specimens certainly suggest that the birds were vagrants just arriving. According to Bond (Check-List of birds of the West Indies. 1945, p. 143), *fortirostris* breeds on Barbados, was probably introduced on St. Vincent, was introduced and is now established on Barbuda and Antigua, and is said to have been introduced on St. Kitts. Mr. Bond, whom I informed about my experience, agrees (*in litt.*) that the small flock I met at Galibi probably consisted of vagrants from Barbados and now believes that the St. Vincent records of *fortirostris* also pertain to vagrants. He further tells me that the Barbadian Grackle is definitely not a migrant in the ordinary sense, for it is abundant on Barbados throughout the year. It is relatively more numerous than any other race of *Q. lugubris*, and this may account for its proclivity for vagrancy.

Our local race in Surinam, *Quiscalus l. lugubris*, occurs in quite a different habitat from that in which I found the birds at Galibi. It frequents lagoons and inundated areas, providing there is open water with scattered bushes and trees. In this rather restricted habitat it is numerous.

On September 24, 1953, I again visited the coast near the mouth of the Maroni River but I could not find a trace of any *Quiscalus*.—F. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam.*

Indigo Bunting Nesting in Colorado.—On August 5, 1953, Robert J. Niedrach and I observed a singing male Indigo Bunting (*Passerina cyanea*) east of Morrison, Jefferson County, Colorado. Nesting activity was suspected when the bird was again seen at the same place on August 7. The next morning, John W. Flavin and I located the nest in marginal weed growth of a dense roadside thicket. It contained four well-grown young and was placed two feet high in a thistle (*Cirsium lanceolatum*) associated with a heavy stand of ragweed (*Ambrosia trifida*) and cordgrass (*Spartina* sp.). As is often the case, the nest contained facial tissue and cigarette papers in the foundation; Angus cattle hairs were used in the lining.

A second male of this species was seen in the vicinity, as well as many of the Lazuli Bunting (*Passerina amoena*).

Returning early on August 9, we found only three young in the nest. Dr. Alfred M. Bailey secured stills and movies of the male feeding the nestlings (plate 24). The female did not come to the nest. Two young were banded, the third eluding capture. On August 10, we found the nest destroyed by mowing.

Though there are ten published records of the occurrence of *Passerina cyanea* in Colorado, this is the first established instance of breeding. The observations of Dearing and Dearing (Condor, 48: 139–140) on nesting activity near Flagstaff, Arizona, are apparently the only such record for the species west of central Colorado—A. Lang Baily, *Denver Museum of Natural History, Denver, Colorado.*

Phoebe Nests with Three Cowbird Eggs.—Two Phoebe (*Sayornis phoebe*) nests, located on small cliffs near water in Seneca, Maryland, had each been victimized three times by Cowbirds (*Molothrus ater*) when first discovered on May 16, 1953. The first nest held three Cowbird eggs but none of the Phoebe. Since the three eggs differed markedly from one another in background color and in distribution of spots, they were presumably laid by different Cowbirds. On May 20, two newly-hatched young were present, but on May 23 the nest was empty. The second nest held two newly-hatched Cowbirds, one Cowbird egg, and three Phoebe eggs on May 16. On the following day the Cowbird egg hatched. The Phoebe eggs gradually disappeared in the course of the following week. On May 24 the young cowbirds were in the nest, but it was empty when visited late in the afternoon of May 25. This may have been the tenth day after hatching for two of the Cowbirds and the ninth day for the third, suggesting that the Phoebes had successfully fledged three young Cowbirds.—Lawrence Kilham, *8302 Garfield St., Bethesda, Maryland.*

Unusual Nesting Behavior of the Brown-headed Nuthatch.—On the campus of Georgia Teachers College, Statesboro, Bulloch County, Georgia, during April and early May, 1951, two pairs of Brown-headed Nuthatches (*Sitta pusilla*) simultaneously nested in a single cavity. We spent at least one and sometimes as many as three hours at the nest each day from April 5 through May 1. A few observations were made prior and subsequent to these dates.

The nesting cavity was located in a dead stub of a pecan tree about seven feet above the ground. In addition to the nuthatches, a pair of Eastern Bluebirds (*Sialia sialis*) nested in the same stub about nine inches above the opening to the cavity used by the nuthatches. Why this particular stub was so populated is difficult to ascertain. Nearby there were many pecan trees with similar dead stubs seemingly as suitable as nesting sites.

The nuthatches did not molest the bluebirds nor attempt to interfere with their nesting. However, the bluebirds constantly attacked the nuthatches. In spite of this, the nuthatches seemed to have no fear of the bluebirds and frequently alighted

BAILY: INDIGO BUNTING NESTING IN COLORADO. PHOTOGRAPH BY A. M. BAILEY.

on the same branch with them. While the nuthatches were feeding young from outside the nesting cavity, the bluebirds often forced them to retreat within the cavity. The bluebirds, as far as we know, made no attempt to destroy the nest of the nuthatches.

At the start of our observations on this nest, we were not aware that two pairs of birds were using the same cavity for nesting. Therefore, we do not know if both pairs started work on the nest simultaneously. We do know that both pairs contributed in the construction of the nest, as we observed three of the adult birds carrying nesting material while the fourth adult was known to be in the nesting cavity. The nest itself was an excavated cavity about nine inches below the opening in the limb. The bottom of the cavity was lined with dry grass, strips of inner bark, and the "wings" of pine seeds.

The mating of at least one pair of the nuthatches was observed several times. On April 8 one nuthatch approached the nest with food in its mouth and called. He fed the female, who was on the nest, and then both flew to a nearby tree. The female started to vibrate her wings rapidly (as did any of the adults while feeding the young). The male then mated with her. Both flew from the branch. While in flight they came together for a short time and then broke apart. These actions were repeated several times.

The number of eggs laid is not known nor is it known whether they were laid by one female or both. When we opened the nesting cavity for the first time we found seven young. All seven appeared to be approximately the same size which would indicate that all hatched about the same time. According to Bent, the average clutch-size for this species is about five or six eggs while the maximum reported is nine. Thus the young may have been the progeny of just one of the two pairs involved.

We know that both pairs of adults helped feed the young, as we observed all four adults carrying food at one time and awaiting their turn to feed the young. Also both pairs helped remove excreta from the nest. There seemed to be no conflict whatsoever between the two pairs of birds. Several times we observed a pair of birds approach the nest. One member of this pair would then feed the incubating bird (one of the other pair); then both members of the first pair would fly away together.

Sixteen days after the young left the nest, we observed seven young and two adults within two hundred yards of the nesting site. We assume that this was the same family group that we had been studying. The other pair of nuthatches apparently had abandoned the group sometime after the young left the nest.

There are several records in the literature of two females of the same species or of two full pairs of the same species sharing a common nest. Some of the species reported nesting in this manner have been Song Sparrows, Tree Swallows, Robins, Wood Ducks, and canaries. As far as we know this is the first report of this behavior in the Brown-headed Nuthatch. Some of the literature relating to this problem is summarized by Brackbill (Auk, 69: 302–307, 1952).

The authors gratefully acknowledge the help of Gibson Johnson, Jr. in making some of these observations.—WARREN J. HOUCK, *Humboldt State College, Arcata, California,* and JAMES H. OLIVER, *Florida State University, Tallahassee, Florida.*

A Simple Method for Obtaining Attentive Data.—The accumulation of data concerning the amount of time spent in incubation by a female bird requires either many hours of observation or some instrument (Kendeigh, Illinois Biol. Monogr., 22[1–3]: 5–10, 1952). However in many cases because time or an instru-

ment may be lacking, a simpler method may be desired. An estimate of the proportion of time spent on the nest may be obtained merely by observing the nest at random times and determining the proportion of times the bird is on the nest. By this method it is possible to visit a number of nests serially and record presence or absence of the incubating bird. Some precautions are necessary. The visits obviously must not alarm the bird. Also, as in all such studies, the visits must be made at various times of the day if a detailed study is being made. Obviously the duration of the attentive periods can not be obtained by this method.

A test of this method is possible with some data on Hammond's Flycatcher (*Empidonax hammondi*) obtained at the Montana State University Biological Station (Davis, Auk, 71: 167, 1954). Nests were actually observed for 1159 minutes and the female was incubating 77 per cent of this time. Long after the data were collected "pretend" visits were made to the nest at 15 minute intervals. The procedure was to go through the original notes which recorded consecutive observations and note whether the bird was on or off the nest on the hour and at 15, 30, and 45 minutes after the hour. These data give a random sample of the observations. A total of 87 "visits" were made, and the female was present on 73.2 per cent of them. Since two times the standard error is 9.6 per cent, the value (73.2 per cent) is not significantly different from the actual 77 per cent. Furthermore it should be remembered that the 77 per cent is also an estimate (since only a sample of incubation observations was made) and so there is some variance there.

Dr. S. C. Kendeigh generously permitted analysis of the original records of incubation for three other species of birds. The detailed data for one female of each is as follows:

	Actual time (in minutes)		*Per cent of time*	*Pretend visits. Number of times female was*		*Per cent of time*
Species	*On nest*	*Off nest*	*on nest*	*On nest*	*Off nest*	*on nest*
Bluebird (*Sialia sialis*)	5883	5558	51.4	377	353	51.6
Catbird (*Dumetella carolinensis*)	4780	2446	65.9	299	155	65.9
House Wren (*Troglodytes aëdon*)	7860	5345	59.4	521	327	61.4

The "pretend" visits were made by recording at 15 minute intervals whether the bird was on or off the nest. The differences in percentages by the two methods are obviously not significant.

This simple method should be useful to obtain data on a large scale without undue expenditure of time.—DAVID E. DAVIS, *The Johns Hopkins School of Hygiene and Public Health, Baltimore 5, Maryland.*

Black-crowned Night Herons Flying with Retracted Feet.—The observation recorded by Lawrence H. Walkinshaw (Auk, 70: 204, 1953) in regard to the Sandhill Crane flying with retracted legs during cold weather has prompted me to offer an observation.

To the rear of the bird house at The National Zoological Park, Washington, D. C., there exists a nesting colony of the Black-crowned Night Heron (*Nycticorax nycticorax*) consisting of approximately one hundred nesting pairs. When the winters are open many of the herons remain in the vicinity of their nesting site and fish by night in nearby Rock Creek and the Potomac River.

I have observed these nocturnal birds returning singly in the early morning to their roosting area. At 7:45 on a February morning in 1952 when the temperature was twenty-five degrees F., I observed two herons flying with retracted legs toward the trees in which they spend the day.—MALCOLM DAVIS, *The National Zoological Park, Washington, D. C.*

Notes on Western Grebe in British Columbia.—In 1941, information on the Western Grebe (*Aechmophorus occidentalis*) in British Columbia was published by J. A. Munro (Occ. Papers B. C. Prov. Mus. No. 3). Some recent observations of migration and records of breeding are reported here.

The only records of autumn migration given by Munro (*op. cit.*) are for the Okanagan Valley and points near or on coastal waters. Johnstone (Occ. Papers B. C. Prov. Mus. No. 7, 1949) gives a number of records of autumn migration of Western Grebes in the southern Kootenay area. Six records between October 18 and November 12 of various years involve seven birds or fewer, whereas on October 13, 1948, he recorded 51 Western Grebes on Crow's Nest Lake.

During early October, 1951, I counted considerable numbers of Western Grebes at various points in the Kootenay region. Some of the records follow: Moyie Lake, October 2, 210; Spillimacheen, October 3, 250; Golden, October 4, 300; Kinbasket Lake, October 6, 1400; and Columbia River near Boat Encampment, October 6, 21. At the point where the latter observation was made, the Columbia River is a rough and rapid stream flowing through a narrow rocky channel, a habitat hitherto considered most unattractive to aquatic birds. All the points mentioned are adjacent to the western slope of the Rocky Mountains and presumably are the first resting points encountered by Western Grebes on their westward movement from the prairies. It seems apparent from a comparison of the above records with those given by Johnstone (1949) that the Western Grebe migration is at its peak in early October.

Only one nesting colony, that at Williams Lake in the Cariboo region, has previously been recorded in British Columbia (Munro, 1941). An isolated breeding record mentions downy young found at Swan Lake, in the Okanagan Valley, in 1933 (J. A. Munro, Condor, 37: 178, 1935).

On June 7, 1950, I visited Swan Lake with J. A. Munro. Two groups of Western Grebe nests were found in round-stem bulrush (*Scirpus acutus*) marsh on the east side of the lake. Seventeen nests were located: of these, five nests contained two eggs, ten contained three eggs, and two contained four eggs. There were approximately 85 adult Western Grebes on the lake at this time.

On June 7, 1951, we again visited Swan Lake but did not search the marsh area for Western Grebe nests. One nest and one newly hatched young were seen during the course of a circuit of the lake. Approximately 75 adult Western Grebes were observed.—DAVID A. MUNRO, *Canadian Wildlife Service, 150 Wellington St., Ottawa, Canada.*

Prairie Falcon "Playing."—On August 2, 1951, while conducting a waterfowl survey of rangeland sloughs in the Nicola area some 40 miles south of Kamloops, British Columbia, my attention was drawn by the behavior of a Prairie Falcon (*Falco mexicanus*). The bird was first noted soaring upward against a moderate wind; several times it rose to a height of about 70 feet and then swooped down to within four or five feet of the ground. After a moment it became apparent that the falcon held an object in its talons; soon the bird dropped to the ground with the object, and I approached it in order to identify its prey. As I drew close to the falcon it took wing, but since I was carefully marking the object it had previously

dropped I did not notice whether or not it was then carrying anything with it. The object with which the falcon had previously been engaged was a piece of dried cow manure about the size of a robin. Again turning my attention to the bird, I saw it some 50 feet above ground with another piece of cow manure in its talons. Several times after that the falcon dropped the piece of manure in mid-air and immediately swooped down and seized it before it had fallen more than about 25 feet. Then the bird alighted on an almost bare patch of ground and commenced to toss the piece of manure several feet ahead of it and then flutter after it and pounce on it. This was done repeatedly. The final, distinct routine noted involved the falcon rising several feet from the ground, flinging the piece of manure ahead and above it, and attempting to catch it while still in the air. The tossing was done with both talons. The falcon was not consistently successful in recapturing the piece of manure in this manner.

The episodes described above took place in about 20 minutes. At the end of this period the falcon flew away and eventually disappeared over a low hill.

To attempt objective interpretation of the observed behavior is difficult. One cannot help but be reminded of the play of young cats with simulated prey objects. While it seems reasonable to assume that such play develops skill in capturing and handling of prey objects, one wonders about the nature of the stimulus giving rise to such action involving an inanimate and unpalatable object.—David A. Munro, *Canadian Wildlife Service, 150 Wellington St., Ottawa, Canada.*

NOTES AND NEWS

Seventy-second Stated Meeting

The Seventy-second Stated Meeting of the A.O.U. on the University of Wisconsin campus at Madison will follow the general chronological pattern used last year. Business meetings will be held on Wednesday, September 8, 1954, two days after Labor Day. Paper sessions will occupy Thursday, Friday, and Saturday. The meeting will close with a field trip to the Horicon Marsh area, Sunday, September 12.

Housing facilities in the University dormitories will be available for approximately two hundred persons. The paper sessions will be held in the theater of the Memorial Union, which faces Lake Mendota and which was the site of a highly successful meeting of the Wilson Ornithological Club in 1949.

RECENT LITERATURE

Wildlife Management.—Reuben Edwin Trippensee. **Vol. I: Upland Game and General Principles,** x + 479 pp., 71 tables, 38 figs., 1948, $6.50. **Vol. II: Fur Bearers, Waterfowl and Fish,** xii + 572 pp., 41 tables, 140 figs., 1953, $7.50. New York, Toronto and London: McGraw-Hill Book Company, Inc.

This textbook on game species is an attempt to provide a pertinent summary of life-history information and a related discussion of management experience. The work as a whole is almost equally divided between these two subjects. The five main sections of Volume I cover farm wildlife, forest wildlife, wilderness wildlife, wildlife administration, and miscellaneous wildlife relationships. In the appropriate sections there are chapters on European Partridge, pheasants, Bob-white, Wild Turkey, American Woodcock, Ruffed Grouse, and other grouse. There are 14 chapters on mammals and one, by E. C. O'Roke, on diseases and parasites. Volume II is divided into three main parts—fur bearers, waterfowl, and fish. There are separate chapters on water and its management, marsh and swamp management, waterfowl ecology, river or puddle ducks, bay or diving ducks, and swans and geese. In addition, there is a chapter on waterfowl management by Ira N. Gabrielson, describing U. S. Fish and Wildlife Service techniques.

Each volume has its own set of general references, and each chapter its own bibliography. One of the best features of this work is the series of excellent avian distribution maps. The 47 maps included in the two volumes come from a variety of sources. McClanahan's maps of upland game species are extended by C. H. D. Clarke to include Canada. Waterfowl maps by Kortright and the Fish and Wildlife Service are amply scaled and a joy to behold. One only wishes that the individual compilers in the Service had been identified, that all the maps were individually dated, and that an effort to dress up four flyway maps had not been dignified by publication. All distributional maps tend to become outdated quickly, and in the present work (European Partridge, Wild Turkey) maps and text occasionally contradict each other.

Teachers of wildlife management in American universities must assume that their students have little knowledge of the ecology of the species they are about to study. Dr. Trippensee has wisely written with this in mind, and his species-by-species treatment of upland game contains much useful reference material for ornithologists and others. The chapters on waterfowl are less useful. In writing Volume I, Dr. Trippensee has assumed that his readers know something about the identification of the upland game animals he discusses. In Volume II, each species of waterfowl has its own description, and is pictured in pen and ink (mostly by Peter Ward). Consequently, the three chapters on waterfowl represent 118 pages that could have been greatly condensed.

It is extremely difficult to appraise the intellectual content and critical position of a compilation like this some ten years after most of the text was written. Trippensee (Vol. I, 1948) still looks on the cyclic fluctuations of animal populations as being correlated with the recurrence of sun spots. He advocates refuges for Bob-white, European Partridge, and pheasant under conditions of heavy hunting, a conservation technique that has been out of favor for the past decade. Although the predator-control campaigns of the Fish and Wildlife Service have been an important part of the Government wildlife management program, Dr. Trippensee devotes but nine lines to these in his chapter on predatory relationships.

The restriction of the term "wildlife" to economically important species constitutes the most important deficiency of this interesting work. Song birds are mentioned

only twice in the entire text, and the cranes, California Condor, and Ivory-billed Woodpecker are not considered at all. I am sure the author omitted with regret reference to these and other species; yet the omission reflects the interests of the materialistic society in which we live. I hope that the student readers of this book will not consider the species it covers as being the only ones that America wants to manage and perpetuate.

The two volumes of *Wildlife Management* will satisfy different audiences. Volume I contains a wealth of ecological information about upland game birds, and ornithologists should find it a useful reference work. Volume II should be attractive to students who wish to own a general waterfowl text which also contains much ecological information about fur bearers and fish. Together, the two volumes present an interesting picture of American game management near the close of the 1940's.—Joseph J. Hickey.

The Birds of Burma.—Bertram E. Smythies. Edinburgh, London: Oliver and Boyd. xliii + 668 pp., 31 col. pls., 1 map. Second (rev.) ed., 1953. Price: 4 pounds, 4 shillings, net.—The fate of the first edition of this work (1940, 1,000 copies) has been briefly reported by Ripley (Auk, 63: 631–632, 1946), and is told in detail in the author's preface of the second edition (pp. v–ix). Now, after an interval of almost 14 years, a manual for the Burmese avifauna is again available, although, ironically enough, it appears just when the Union of Burma seems to be wholly devoid of persons interested in ornithology and related branches of natural history! However, illustrated as this book is, it should prove useful and interesting to students in India, Malaya, and especially Thailand (which country is still without any handbook of its own).

"The book has been re-written on former lines but with a view to placing on record all first-hand information of value, whether on a bird's appearance, voice, habitat, behaviour, food, breeding, biology, or status, and distribution collected down to 1948." Described by the publisher as "second (revised) edition," it should be noted at once that this is virtually a new work, for scarcely a sentence survives unchanged from the edition of 1940, and a number of new and valuable features, such as a full bibliography, have been introduced. Perhaps the greatest alteration is found in the nomenclature, which in 1940 followed for the most part that of "The Fauna of British India, Birds," and in 1953 is strongly influenced by the "new systematists." An especially useful element of the book is the systematic hand-list (pp. 568–617), which permits the reader to see at a glance what forms of birds have been recorded from each of the 10 major distribution areas of the Union.

The charming bird paintings of Commander A. M. Hughes, O.B.E., R.N. (retired), have been reproduced with varying success; while the difficult grays and browns are usually true, the blues and greens tend to be overemphasized. Similar criticism may, of course, be directed at almost every illustrated bird book, and these minor flaws should not detract from the value of the plates (showing, in many instances, species seldom or never portrayed).

Finally, while commending the clean typography and careful editing that one has come to associate with this publisher, the reviewer cannot forbear from calling attention also to the truly handsome blue-and-silver dust jacket, with its affixed portrait of the red jungle-fowl.—H. G. Deignan.

Bibliography of North American Minor Natural History Serials in the University of Michigan Libraries.—Margaret Hanselman Underwood. University of Michigan Press. 5 prelim. leaves, unpaged, pp. 1–197, 1954. Price, $1.75.—

Through the years there have been many attempts on the part of naturalists, amateur and professional, to initiate new media for the publication of observations and discoveries by themselves and others. Sometimes the principal coverage was one or more branches of natural history and sometimes that was in a minor position. Often the journal was abortive and failed to last for more than one or two volumes or numbers, but sometimes it survived and occasionally developed into a serious publication that still fills an important niche.

Mrs. Underwood has assembled a list of all such journals as are preserved in the University of Michigan libraries, either complete or fragmentary, and has unearthed a great deal of information about them—changes of title or format, pagination, frequency and dates of publication, editorship, and other such details. In addition, various collaborators have supplied annotations regarding the importance or content of the journals, their most noteworthy contributors, and often the titles of their contributions.

The list, of course, is not perfectly complete since it is restricted to what is in the libraries in question, but it goes far in that direction. Certainly it supplies a great deal of information that would be difficult to find without considerable time and effort, both of which were unquestionably expended on the project by the author of this bibliography. There is no comparable publication, and the present one thus makes a very welcome addition to the reference shelf.—JOHN T. ZIMMER.

The Birds of Japan, Their Status and Distribution.—OLIVER L. AUSTIN, JR., and NAGAHISA KURODA. Bull. Mus. Comp. Zool., 109: 280–637, 1 plate.—The senior author, as a keen GH2 official as well as a good friend to the Japanese ornithologists, resided in Tokyo during the post-war years from 1946 to 1950. The present publication is therefore being heartily welcomed by all the Japanese ornithologists. It is particularly happy for them to find many citations from their reports which attracted little attention of Western ornithologists owing to the language difficulties. During his sojourn, Dr. Austin travelled to many parts of Japan and was an enthusiastic investigator of bird distribution and abundance. Game management in Japan owes much to his keen advice. Therefore, the most valuable part of this book is the descriptions of the status of the bird.

His post-war visit to Japan, however, was unfortunate for him as a taxonomist, for, of the Kuroda, Sr., Takatsukasa, and Yamashina collections on which 'A Hand-list of the Japanese Birds' (3rd ed., 1942) was based, he could examine only the last. In fact, the specimens used for comparison in preparing the Hand-list were in Kuroda and Takatsukasa collections of older history. This would have made it difficult for Austin to obtain better knowledge than that given in the 1942 Hand-list concerning subspecies.

As to the classification, it is apparent that Yamashina's cyto-systematics were always in his mind, as they are referred to throughout the book. But, they are not followed by him. This may be natural for a book of the present-day when most systematists are not willing to contemplate seriously the 'species' itself. Austin says of *Motacilla grandis* "Nonetheless in morphology, habits, and all other characteristics it differs no more from the various strongly marked races of *M. alba* than they do from one another." (p. 567) Yet he makes *grandis* a valid species! This will suggest that although systematists are not willing to do so for the present, time will compell them to reckon with cyto-systematics. When they realize the fact that both artificial and natural selection are similarly under control of a single and common natural rule and when they reach the conclusion that the classification of domestic animals is also to be included in their job, I believe they will surely recognize the need of cyto-systematics.

A correction is necessary concerning the fertility of the F_1 of *Phasianus colchicus* × *P. versicolor*-hybrid mentioned on pages 392 and 393. In 1930, the Ministry of Agriculture and Forestry released at various parts of Honshu young Ring-necked Pheasants raised at the game farm, with the object of supplementing the decreasing Green Pheasants. If this were continued, the extinction of the pure stock of Green Pheasants was quite possible as their F_1 hybrids are totally fertile. But, by the initiative of the late Marquis Hachisuka (Tori, 5: 148–151), the Ornithological Society of Japan proposed the release of Green Pheasants. Thereafter, the Greens only were released in Honshu, and the Ring-necks in Hokkaido. It was fortunate that most Ring-necks released in Honshu were young and died out soon (Yamashina, Tori, 5: 147), and few grown ones were produced by backcross with the Greens. Still at present an occasional Green Pheasant with a pale patch on the neck is reported from Honshu. Whether this is atavism of the wild stock or the remaining hybrid character is not certain.

Minor errors are found in the translation of a few of the Japanese names of birds. For example, "Makino" for *Locustella lanceolata* is translated as "pasture" but in reality it comes from the name of the man who collected it first. These corrections should have been made by the junior author.

In short, however, this book is undoubtedly a useful guide to the students of the status of birds in Japan, particularly for the Westerners who want to know about the ecology of unfamiliar Japanese species.—Y. YAMASHINA.

Bird Survey of the Detroit Region 1952. THE DETROIT AUDUBON SOCIETY [c/o Harriet B. Woolfenden, Terrace 6, 4600 Firestone, Dearborn, Mich.] iv + 83 pp. mimeographed, 1 map, October 24, 1953. 10 cents.—Some years ago, the Bird Calendar of the Cleveland Bird Club represented a high watermark in the efforts of amateur ornithologists to produce a periodic, quantitative picture of the birdlife of their local region. The Bird Survey Committee of the Detroit Audubon Society is now seriously bidding for this distinction. Its latest annual report contains a series of brief summaries of each season's observations, a conventional, 40-page annotated list of species reported in 1952, an interesting summary of the year's work by four bird banders, and an extremely valuable progress report on the breeding birds of the Detroit Region.

It is this impressive final 18-page chapter by Douglas S. Middleton that particularly compels one's admiration. Starting in 1949, the Committee worked out a permanent system of detailed nest-record cards which now number more than 3,200 in its file at the Cranbrook Institute of Science. The ten-year analytical report that is promised is certain to be a unique and highly important contribution to North American ornithology, and one that could well be a similar goal for every seriously minded bird club in North America.

Ralph A. O'Reilly, Jr., Douglas S. Middleton, Neil T. Kelley, Walter P. Nickell, and Clarence J. Messner served as the editors of the 1952 Survey. Ninety-seven members of their society submitted 25,639 records. The Michigan Conservation Department furnished results of its interesting aerial surveys of waterfowl populations. The Detroit Audubon Society merits a round of applause on the publication of this fine report. One only wishes that a title page would have carried the names of the editors, not only as an aid to bibliographers but as a more conspicuous and quite proper acknowledgement of credit for a compilation that must have required a lot of time and hard work.—JOSEPH J. HICKEY.

ABDEL-MALEK, E. T. 1953. Life history of *Petasiger chandleri* (Trematoda: Echinostomatidae) from the Pied-billed Grebe, *Podilymbus podiceps podiceps*, with some comments on other species of *Petasiger*. Journ. Parasit., **39** (2): 152–158.—First intermediate host an aquatic snail, second intermediate host various species of fish.

ADAMS, J. R., AND J. F. BENDELL. 1953. A high incidence of blood parasites in a population of Sooty Grouse. Journ. Parasit., **39** (4, Sect. 2): 11.—On Vancouver Id., *Haemoproteus*, *Leucocytozoon*, *Trypanosoma*, and *Microfilaria* were all very common.

ANDREW, D. G., AND G. L. SANDEMAN. 1953. Notes on the birds of the Flannan Isles. Scot. Nat., **65**: 157–166.—Annotated list of 23 species.

ARTHUR, D. R. 1953. The morphology of the British prostriata with particular reference to *Ixodes hexagonus* Leach. II. Parasitology, **42**(3): 161–186.—Detailed anatomy of ticks, correlated with distribution on birds and mammals.

ARTHUR, D. R. 1953. The immature stages of *Ixodes frontalis* Panzer, 1795. Parasitology, **43**(1): 175–177.—From Blackbird, Chaffinch, and Willow Warbler in England.

ARTHUR, D. R. 1953. The systematic status of *Ixodes percavatus* var. *rothschildi* Nuttall and Warburton 1911. Parasitology, **43**(3): 222–226.—From Puffin, Herring Gull, and Manx Shearwater in British Isles.

ARTHUR, D. R. 1953. *Ixodes theileri* n. sp., with observations on species confused therewith. Parasitology, **43**(3): 239–245.—Tick described from five species of South African birds; three closely related species from birds in various continents are differentiated and most of their hosts listed.

BABERO, B. B. 1953. Studies on the helminth fauna of Alaska, XVI. A survey of the helminth parasites of Ptarmigan (*Lagopus* spp.). Journ. Parasit., **39**(5): 538–546.—Three species of ptarmigan represented by 292 individuals examined; 109 infested with one or more of 11 species of worms.

BARNARD, G. C. 1954. Notes on the nesting of the Thick-billed Euphonia in the Panama Canal Zone. Condor, **56**: 98–101.

BARTHOLOMEW, J. 1953. Five successive broods in Stock-dove's nest. Scot. Nat., **65**: 195.

BOEKER, H. M. 1954. A census of populations of the Wilson Snipe and Sora Rail in the Yampa River Valley, Colorado. Condor, **56**: 105–106.

BRODKORB, P. 1954. Another new rail from the Pleistocene of Florida. Condor, **56**: 103–104.—*Porzana auffenbergi*, new species.

CHERNIN, E. 1953. The length of the prepatent period in a filarial infection of ducks. Journ. Parasit., **39**(5): 574–575.—A filarial nematode acquired by insect bites in Michigan began producing microfilariae after six to nine months.

COMBY, J. H. 1954. Ground Dove nesting at Anaheim, California. Condor, **56**: 104–105.

CROSS, A. 1953. Inland nesting of Herring Gull. Scot. Nat., **65**: 195.

DEGARMO, W. R. 1953. A Five-Year Study of Hawk Migration. Redstart, **20**(3): 39–54.

DILGER, W. C. 1954. Electrocution of Parakeets at Agra, India. Condor, **56**: 102–103.

DUGAND, A. 1954. *Bubulcus ibis ibis* (Linnaeus) en Colombia. Lozania (Acta Zoologica Colombiana), **8**: 1–7.—Status of the Cattle Egret in Colombia.

DUMONT, PHILIP A. 1953. Behavior of Bobolinks on Fall Migration. Atlantic Naturalist, **9** (1): 35.

EDWARDS, J. GORDON. 1954. A New Approach to Infraspecific Categories. Systematic Zoology, **3** (1): 1–20.

EGGELING, W. J. 1953. Herring Gull nesting on a roof top. Scot. Nat., **65:** 195.

EMBLEN, D. L. 1954. Caspian Terns nesting at San Diego Bay. Condor, **56:** 109–110.

ETGES, F. J. 1953. Studies on the life histories of *Maritrema obstipum* (Van Cleave and Mueller, 1932) and *Levinseniella amnicolae* n. sp. (Trematoda: Microphallidae). Journ. Parasit., **39**(6): 643–662.—Life cycles of the two species are similar. First intermediate host, a fresh water snail; second intermediate host, an aquatic isopod (*Asellus*); final host, ducks, and, experimentally, various birds and mammals.

FENNELL, C. M. 1954. Notes on the nesting of the Kestrel in Japan. Condor, **56:** 106–107.

FREEMANN, R. S. 1954. *Paradilepis rugovaginosus* n. sp. (Cestoda: Dilepididae) from the Osprey, with notes on the genus *Oligorchis* Fuhrmann, 1906. Journ. Parasit., **40**(1): 22–28.

FRENCH, N. R. 1954. Notes on breeding activities and on gular sacs in the Pine Grosbeak. Condor, **56:** 83–85.

FURMAN, D. P., AND I. B. TARSHIS. 1953. Mites of the genera *Myialges* and *Microlichus* (Acarina: Epidermoptidae) from avian and insect hosts. Journ. Parasit., **39**(1): 70–78.—Taxonomic notes on hyperparasites of hippoboscid flies parasitic on various birds in California.

GARDEN, E. A. 1953. Grasshopper Warbler in Ross-shire. Scot. Nat., **65:** 197.

GLENNY, FRED H., AND H. FRIEDMANN. 1954. Reduction of the clavicles in the Mesoenatidae, with some remarks concerning the relationship of the clavicles to flight-function in birds. Ohio Journ. Sci., **54** (2): 111–113.—The clavicles of three species of Mesoenatidae are described. The reduction in these bones and the loss of flight for birds in general is discussed.

HEDGPETH, J. T. 1954. Incubation in the Chestnut-backed Chickadee. Condor, **56:** 109.—Incubation period found to vary from 13 to 15 days.

HERMAN, C. M., AND E. E. WEHR. 1953. Occurrence of *Amidostomum* in Canada Geese. Journ. Parasit., **39**(4, Sect. 2): 34.—This pathogenic gizzard nematode is widely distributed in the U. S. and is apparently responsible for winter mortality on a North Carolina refuge.

HOFFMAN, G. L. 1953. *Scaphanocephalus expansus* (Crepl.), a trematode of the Osprey, in North America. Journ. Parasit., **39**(5): 568.

HOWELL, T. R., AND W. R. DAWSON. 1954. Nest temperatures and attentiveness in the Anna Hummingbird. Condor, **56:** 93–97.—Torpidity absent in parent *Calypte anna* while incubating and brooding young. The nest temperature was always about 10° C. above air temperature at night. Young birds in the nest gradually attain a capacity for homeothermy.

HUBBS, CARL L., AND CLARK HUBBS. 1953. An Improved Graphical Analysis and Comparison of Series of Samples. Systematic Zoology, **2** (2): 49–56, 92.

HUGGHINS, E. J. 1954. Life history of a strigeid trematode, *Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931. I. Egg and miricidium. Trans. Amer. Micro. Soc., **73**(1): 1–15.—Adults cosmopolitan in cormorants; first intermediate host, an aquatic snail; second intermediate hosts, Black Bullhead and Bluntnose Minnow.

HUGGHINS, E. J. 1953. Life history of a strigeid trematode, *Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931. Journ. Parasit., **39**(4, Sect. 2): 15–16.

HUNTER, W. S., AND T. L. QUAY. 1953. An ecological study of the helminth fauna of Macgillivray's Seaside Sparrow, *Ammospiza maritima macgillivrai*

(Audubon). Amer. Midl. Nat., **50**(2): 407–413.—Nine species of trematodes, three of cestodes, two of Acanthocephala, and seven of nematodes were found. Nematodes were more frequent in adult sparrows, whereas young birds carried greater infections of helminths of the other groups.

JUDD, W. W. 1953. A collection of feather lice (Mallophaga) from birds in Ontario. Trans. Amer. Micr. Soc., **72**(4): 349–350.—A host list for 18 species of lice.

KERR, RENWICK. 1954. American Egret Catches Fish While Flying. Atlantic Naturalist, **9** (4): 201.

LAIRD, M. 1953. *Plasmodium vaughani* Novy and MacNeal, 1904, in the New Hebrides: with a note on the occurrence of elongatum-type exoerythrocytic schizogony in this species. Journ. Parasit., **39**(4, Sect. 1): 357–364.—From Yellow White-eye.

LEWIS, MERRIAM GARRETSON. 1954. The Relation of Bounties on Hawks and Owls to Mouse Injury in Orchards. Raven, **25** (1): 3–5.

MAWSON, PATRICIA M. 1953. Parasitic nematoda collected by the Australian National Antarctic Research Expedition: Heard Island and MacQuarie Island, 1948–1951. Parasitology, **43**(3): 291–297.—An extensive host list of bird nematodes, with descriptions of three new species, from four penguins, two petrels, and a cormorant, respectively.

MILLER, LYLE D. 1953. Bird Islands of Hog Island Bay [Va.]. Raven, **24**: 87–88.

MUNRO, J. A. 1954. Unusual records from California. Condor, **56**: 108. *Sayornis phoebe, Empidonax difficilis* (winter), *Ammospiza caudacuta, Melospiza georgiana.*

MURRAY, J. J. 1953. First Revision of the Virginia 1952 'Check-List.' Raven, **24**: 34–45.

MURRAY, J. J. 1953. Further Changes in the Virginia List. Raven, **24**: 57–58.

MYLNE, C. K. 1953. Yellow-billed Cuckoo at Montrose. Scot. Nat., **65**: 196–197. —Sight record.

NEILAND, K. A. 1953. *Leucochloridium perisoriae*, a new species of trematode (Leucochloridinae) from the Oregon Jay, with a discussion of the application of host-parasite relationships to the taxonomy of this [parasite] group. Journ. Parasit., **39**(5): 553–557.

PARMALEE, P. W., AND M. A. PRICE. 1953. *Bruellia illustris* (Kellogg) and other ectoparasites from the Bobwhite Quail in Texas. Journ. Parasit., **39**(2): 222–223.

PENNER, L. R. 1953. The biology of a marine dermatitis-producing schistosome cercaria from *Batillaria minima* (Gmelin). Journ. Parasit., **39**(4, Sect. 2): 19–20.—Swimmers' itch in Florida caused by cercariae emerging from Black Horn Shell. Adult flukes, *Ornithobilharzia canaliculata*, in Royal Tern and probably other terns.

PENNER, L. R. 1953. The Red-breasted Merganser as a natural avian host of the causative agent of clam diggers' itch. Journ. Parasit., **39**(4, Sect. 2): 20.—Cercariae emerge from snail *Nassa obsoleta* and cause the disease. Adult flukes, *Austrobilharzia variglandis*, are universal in the Red-breasted Merganser in Connecticut.

PENNER, L. R. 1953. Experimental infection of avian hosts with *Cercaria littorinalinae* Penner, 1950, Journ. Parasit., **39**(4, Sect. 2): 20.—Several species of birds were experimentally infected. Brandt Cormorant and Western Gull are the chief natural hosts near San Diego of this swimmers' itch-producing fluke.

PHILLIPS, NEILL. 1954. Spring Concentration of Red-tailed Hawks. Atlantic Naturalist, **9**(4): 201.

RAND, A. L. 1954. Social Feeding Behavior of Birds. Fieldiana: Zoology (Chicago), **36**(1): 1–71.—The thesis is developed that complicated social feeding behavior, both within species and between different species can be better understood by comparing it with other, less specialized behavior. A number of such series are present, with examples drawn from many groups of birds. It is pointed out that these series are not necessarily phyletic. Behavior patterns can change quickly and the use of similarities in behavior to infer relationships must receive the same scrutiny as the use of any other set of characters.

The factors bringing about social behavior in feeding can operate between as well as within species. At the simplest level curiosity, gregariousness, sight of food, or even chance associations can bring individuals together; experience of benefits may continue and modify it. Finally in an evolutionary sense, it may become a fixed part of a species' behavior. The extreme acuity of birds in seizing on small, favorable elements in their environment emerges. In some associations competition offsets some of the benefits of the mutual aid.

RICHMOND, W. K. 1953. Pomatorhine Skuas in Forth. Scot. Nat., **65**: 194–195.

SACHS, I. B. 1953. Certain blood-inhabiting protozoa of birds in the vicinity of Urbana, Illinois. Trans. Amer. Micro. Soc., **72**(3): 216–227.—Records of *Leucocytozoon*, *Trypanosoma*, and *Haemoproteus* in many land birds.

SAUNDERS, ARETAS A. 1954. Feathers, Plumages, and Colors. Atlantic Naturalist, **9**(4): 185–194.

SCHELL, S. C. 1953. Four new species of *Microtetrameres* (Nematoda: Spiruroidea) from North American birds. Trans. Amer. Micro. Soc., **72**(3): 227–236. New species of proventriculus worms from the Raven, Golden Eagle, Great Horned Owl, and Goshawk.

SCHILLER, E. L. 1953. Studies on the helminth fauna of Alaska. XIV. Some cestode parasites of the Aleutian Teal (*Anas crecca* L.) with the description of *Diorchis longiovum* n. sp. Proc. Helm. Soc. Wash., **20**(1): 7–12.

SCHULZ, K. 1954. Record of the Water-thrush in Oakland, California. Condor, **56**: 105.

SCOTT, F. R. 1953. Loblolly Pine as a Food Factor for Red-wings. Raven, **24**: 63.

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WOLFSON, ALBERT. 1954. Notes on the Cloacal Protuberance, Seminal Vesicles, and a Possible Copulatory Organ in Male Passerine Birds. Bull. Chicago Acad. Sci., **10**(1): 1–23.—In part this covers the subject matter of Salt's paper published in this journal (Auk, **71:** 64–73, 1954). Additional examples and a discussion of terminology are presented. It is suggested that the cloacal protuberance, which is several degrees cooler than the body, functions as a place for the storage and maturation of sperm, and as an aid in copulation. For background it would have been well to mention the comments in Newton's "Dictionary of Birds," and in view of the rather sensational second half of the title to review the subject in birds generally, including the phalloid of the weaver bird *Bubalornis* (Sushkin, 1927, Bull. Amer. Mus. Nat. Hist., **57:** 30–32). A cloacal protuberance also has been recorded for a parrot (Rand, 1936, Bull. Amer. Mus. Nat. Hist., **72:** 396).—A. L. Rand.

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OBITUARIES

ARTHUR ASTLEY, an Associate of the American Ornithologists' Union, elected in 1928, died in Ambleside, Westmorland, England, March 12, 1935, at the age of 61. He was the son of John Lewis and Edith Maud Astley of Elterarter Hall, Ambleside, Westmorland. He was a cripple and for years was unable to leave his home and garden. From boyhood he had studied birds and had a broad knowledge of them. He was widely known as a good ornithologist and was a member of the British Ornithologists' Union for many years.

For 14 years he contributed weekly Nature Notes to the 'Westmorland Gazette' under the nom de plume of 'Alpha.' He also wrote a series of articles from 1915 to 1926 for the 'Parents Review,' published by the Parents National Educational Union. In 1928 these articles were republished as a book entitled 'From a Bird Lover's Diary.' In the preface he wrote "Bird watching is an interest that will bring a man friends in every place, a joy that will stand by him in good fortune or ill, and that will make life, even for an invalid, serene and cheerful."—T. S. PALMER.

STEPHEN THOMAS BIVINS, an Associate of the American Ornithologists' Union since 1946, died at Milledgeville, Georgia, May 2, 1953. Death resulted from the action of an insane person. He was born in Milledgeville on October 30, 1925. After graduating with first honors from Georgia Military College, he entered Cornell University at the age of sixteen and in due course obtained a degree in zoology. Majoring in ornithology under Professor A. A. Allen, he accompanied the latter on many of his photographic trips. Subsequently he took a degree in law at Duke University. His education was interrupted by a call to the Army in 1943. During his service as First Lieutenant in the field artillery in the Pacific and in the Philippine Islands, he contracted a tropical disease and was invalided home. He began the practice of law in Milledgeville in 1950.

His interest in birds, shown at the age of six, continued throughout his life. On the average he lectured on birds once a month. A talk for young people stressed "shooting" birds with a camera instead of a gun. He taught biology for one term at Georgia Military College and engaged in bird-banding for many years. Always interested in young people, he devoted much time to the Boy Scouts. He was a member of the Georgia Ornithological Society, National Audubon Society, and Bird-Banding Association. Unfortunately he had not reached the stage where sufficient leisure was available to commit his bird studies to print. In remembrance of his pleasing personality and other admirable qualities, the new Civic Youth Center of Milledgeville was dedicated to him.—A. W. SCHORGER.

DR. HENRY CLINTON BURGESS, an Associate of the American Ornithologists' Union, elected in 1920, died in Canandaigua, New York, October 23, 1934 at the age of 51. He was born in Flint, N. Y., October 7, 1883, graduated from the Canandaigua Academy in 1902 and from Syracuse Medical College in 1906, and interned at Crouse Irving Hospital in Syracuse. Later he joined the staff of Brigham Hall Hospital in Canandaigua, a private hospital for the treatment of mental patients, and there he remained the rest of his life, except when in military service. During World War I, he served in the Army Medical Corps and after his return to the hospital was appointed physician in charge in 1926. Dr. Burgess was a member of the Canandaigua Medical Society, the Ontario Medical Society, the American Medical Association and the Neuron Club, a psychiatric branch of the A.M.A. He traveled extensively in the United States and made three trips to Europe. One of his chief interests was ornithology, and he spent much time with Dr. Elon Howard Eaton of Geneva

and contributed notes and observations to Eaton's 'Birds of New York.'—T. S. PALMER.

PRINCE FRANCESCO CHIGI DELLA ROVERE, an Honorary Fellow of the American Ornithologists' Union, elected in 1932, died in Rome, July 2, 1953, where he was born April 4, 1881. A gentleman of high culture, he dedicated himself especially to the biological sciences, zoology, ornithology, hunting, and fishing. He was Secretary of the First Administration Council of Rome's Zoological Garden and contributed greatly to its foundation and development. Until his death he was President of the Umbro-Laziale Association for the regulation and development of fishing.

The ornithological contributions of Prince Chigi number about sixty and can be grouped into two periods about fifteen years apart. Between the first and second he apparently discontinued his scientific research. The first period was devoted to systematic, faunistic investigations. His studies included the taxonomy of *Passer*, the Falconidae, and the Anserinae, and he made important contributions to the ornithology of the Latium region.

In the second period the Prince devoted himself to biological and ecological investigations. As owner of Castel Fusano Estate, he founded in his castle a private Ornithological Observatory which, under his direction, won the reputation of being one of the best institutions of its kind at home and abroad. This institution was especially concerned with the migration of the Quail (*Coturnix c. coturnix*), Song Thrush (*Turdus ericetorum*), and other species. To the group of young collaborators which he assembled at the Observatory, he served as a teacher. The Castel Fusano Observatory was destroyed by an Allied air-raid during the last war.

In 1934 he founded 'Rassegna Faunistica' which was published until 1938. He was Director of this publication, and he and his collaborators published in it many original articles on natural history.

The accurate and valuable investigations of Prince Chigi rank high in ornithology. As a polished, well educated gentleman, he will be vividly remembered by his friends and acquaintances.—ALESSANDRO GHIGI.

SARA CHANDLER EASTMAN, an Associate of the American Ornithologists' Union, elected in 1920, died at her home in Portland, Maine, January 17, 1926, at the age of 87. She was born in North Conway, New Hampshire, in 1838 and was educated in the local schools and the academy. She moved to South Paris for a time and then to Portland. For nearly 42 years she taught in various grades of the North School, finally in the ninth at the time of her retirement. Miss Eastman was much interested in birds, was an active member of the Audubon Club as long as she could go afield, and for 20 years sent reports on bird migration to the U. S. Biological Survey. She was noted for her conscientiousness, thoroughness, and scholarly attainments. She summarized her teaching career in a toast which she offered at a luncheon in her honor when she retired: "The old North School in which I have given nearly 42 of the best years of my life, in which I have taught under three honored principals, six superintendents of schools, and many school boards—may it long continue its work of educating and uplifting the youth of our fair city."—T. S. PALMER.

FRANK BISBIN FOSTER, an Associate of the American Ornithologists' Union, elected in 1916, died at his home in Phoenixville, near Philadelphia, Pennsylvania, November, 26, 1940, at the age of 66. He was a retired manufacturer and for many years had been president of the Congoleum Company. He was also well

known as a breeder of Percheron horses and Guernsey cattle. Mr. Foster was fond of hunting big game and made many trips to Alaska, British Columbia, Africa, and Indo China in search of specimens for the animal life groups of the Academy of Natural Sciences of which he was a trustee. Some of the animals which he captured alive were presented to the Philadelphia Zoological Gardens. In 1935, he was appointed by Governor George H. Earle a member of the Pennsylvania Board of Game Commissioners.—T. S. PALMER.

ASTON COLEBROOK GARDNER, an Associate of the American Ornithologists' Union, died in West Worthing, Sussex, England, May 25, 1930. When he was elected a member of the Union in 1919, he was in England, but two years later he was living in Wilmington, Delaware; subsequently he returned to England and remained there until his death. During the period of his membership he contributed a few notes to 'The Auk' for 1921, including 'A Kingbird's Unusual Nesting Site' and 'The Hooded Warbler in Delaware.'—T. S. PALMER.

JAMES RHOADS GILLIN, an Associate of the American Ornithologists' Union, elected in 1945, and his wife, Florence, met their death in an automobile accident south of Wilmington, Delaware, on March 25, 1952. He was born on the family homestead at Ambler, Pennsylvania, March 4, 1886. His profession was nurseryman. His father, Thomas S. Gillin, had an extensive collection of birds and their eggs, and from him he inherited a keen interest in the local flora and fauna. The younger Gillin concentrated on oology and developed unusual skill in the discovery of nests. He became a member of the Delaware Valley Ornithological Club in 1921. On March 2, 1944, he addressed this organization on his experiences in collecting eggs in Pennsylvania and Alberta, and illustrated his talk with a series of eggs from his extensive collection. His egg collection was divided after his death, the greater part going to Wilson C. Hanna and Nelson D. Hoy, and the remainder to Franklin and Marshall College and the Reading Museum. He was interested in bird banding, and devoted much time to various civic affairs.—A. W. SCHORGER.

CAREY ELLIS GREGORY, an Associate of the American Ornithologists' Union, elected in 1922, died in Morganton, North Carolina, April 5, 1944, at the age of 71. He was born in Warfordsburg, Pennsylvania, January 5, 1873, the son of a country doctor, Dr. Job Gregory. He graduated from the Wooster, Ohio, High School and from Wooster College in 1897. He received his master's degree from Princeton in 1900 and graduated from Princeton Theological Seminary in 1901. Dr. Gregory was a Presbyterian minister and held several parishes in Brazil, Ind.; Phelps, N. Y.; Corinth, N. Y.; and Morganton, N. C. He acquired one of the finest private libraries of bird books in North Carolina and for about 30 years kept a record of all the birds he saw or heard in the Piedmont and mountain regions of the state.—T. S. PALMER.

HENRY TEASDEL HALES, an Associate of the American Ornithologists' Union, died in Ridgewood, New Jersey, November 6, 1913, in his 84th year. He was born in Yarmouth, England, February 3, 1830, and resided at Ridgewood for 20 years or more prior to his death. He was elected an Associate of the Union in 1890. Although he contributed no notes to 'The Auk,' he made several contributions to the 'Ornithologist and Oologist,' including an account of 'A Tame Jackdaw' in the number for February 1890, a brief paper on the birds of Ridgewood, and 'Bird Notes from Northern New Jersey' in the numbers for August and September, 1892.—T. S. PALMER.

WILLIAM FRANCIS HENDRICKSON, an Associate of the American Ornithologists' Union for nearly 40 years, died at Jamaica, Long Island, New York, September 29, 1925, in his 60th year. He was born at Glen Cove, Long Island, February 13, 1864, and was elected an Associate of the Union in 1885. His only contribution to 'The Auk,' apparently, was a brief note on the occurrence of the chewink in winter on Long Island, published in the volume for 1903.—T. S. PALMER.

CLIFFORD ERNEST HOPE, an Associate of the American Ornithologists' Union, first elected 1933, died at Toronto, Ontario, August 9, 1953, at the age of 43. Born at Toronto, March 31, 1910, he was a naturalist from boyhood; collecting his first hundred birds with a catapult. Mr. Hope became an expert preparator and in 1932 was appointed to the technical staff at the Royal Ontario Museum of Zoology and Palaeontology, becoming Chief Preparator in the Division of Ornithology. He initiated the collection of bird skeletons, including 114 exceptionally fine mounts and a considerable number of articulated and disarticulated specimens. Mr. Hope participated in or led 10 R.O.M.Z.P. expeditions into various parts of Ontario, beginning in 1933, and including such stations as Favourable Lake, Lake Attawapiskat, Fort Severn, Fort Albany, and Cape Henrietta Maria, all in the Hudson Bay drainage of northern Ontario. In 1944 and 1945, he was loaned to the Ontario Department of Lands and Forests to investigate the effects of DDT spraying on birds in Algonquin Park, to study the relation of breeding birds to the spruce Budworm, and to initiate the bird population studies which are still being carried on in the Wildlife Research Area there. In 1949 he assisted the Ontario Research Foundation in their studies on Ruffed Grouse parasites and cycles. He made a collection of summer birds in Wyoming for the R.O.M.Z.P. in 1950. His published titles total 32. He was a member of the Brodie Club (1928) and the Toronto Ornithological Club (1934). His widow, Catherine, and his daughter, Ann, survive him.—J. L. BAILLIE.

ALICE OLDFIELD (MRS. EDWIN ROBERT) JUMP, an Associate of the American Ornithologists' Union, died in Newton, Massachusetts, March 12, 1929, at the age of 53. She was born in St. John, New Brunswick, in 1876. She was elected an Associate of the Union in 1910 and maintained her membership for nearly 20 years until her death. Her only contribution to 'The Auk' was a brief note in the volume for 1911 on the occurrence of Baird's Sandpiper at Monomoy Point in Massachusetts. —T. S. PALMER.

WILLIAM KILGORE, JR., who became an Associate of the A.O.U. in 1906, died at his home at 3400 List Place, Minneapolis, Minnesota, on Thanksgiving Day, November 26, 1953, at the age of 74. The youngest of 10 children, he was born in Minneapolis on August 15, 1879. He attended school in Minneapolis and later went into the employ of the Northern States Power Company in Minneapolis. In 1921 he became associated with the Minnesota Museum of Natural History where he assisted the late Dr. Thomas S. Roberts with class work in ornithology and in field collecting and the photography of birds. It was Mr. Kilgore's devoted help and encouragement that was a major factor in Dr. Roberts' decision to finally begin the task of assembling and publishing his bird notes into his monumental 'Birds of Minnesota.' Many of Dr. Roberts' students as well as his host of other friends will long remember Mr. Kilgore for his very friendly and congenial personality and for his long-held and deep enthusiasm for the study of birds. He is survived by his wife, Mabel, and his daughter, Mrs. Jane Holmes, both of Minneapolis.—W. J. BRECKENRIDGE.

MISS ZELL CHARLOTTA LEE, an Associate of the American Ornithologists' Union since 1947, died at Sioux City, Iowa, June 23, 1953. She was born at Danbury, Iowa, November 22, 1899. Her scholastic record on graduating from the high school at Anthon won her a four-year scholarship at the University of Iowa. Unable for financial reasons to accept this reward, she took business training in Sioux City. Prior to retirement on account of ill health, she held a responsible position with the Toy National Bank of Sioux City.

She was a member of the National Audubon Society, Woodbury County chapter of the Izaak Walton League, and several local civic clubs. She contributed greatly to the local interest in birds during her ten years as president of the Sioux City Bird Club, especially by bringing the Audubon Screen Tours. Field work was pursued with zeal, careful notes were kept, and annual reports made on the Christmas Bird Census. At the time of her death she was making a nesting study of the Pine Siskin in the Sioux City region.—A. W. SCHORGER.

HARRY ARTHUR MCGRAW, an Associate of the American Ornithologists' Union, elected in 1939, died in Altoona, Pennsylvania, September 29, 1947, at the age of 66. He was born in Altoona, January 21, 1881, attended the elementary schools, and was graduated from the Altoona High School in 1898. In June of that year he became an apprentice of the Pennsylvania Railroad and was employed by the road for 44 years, in later years as a foreman.

From early boyhood he was a lover of the out-of-doors, including camping, hiking, and nature study, with special emphasis on birds; and he aided in the preparation of W. E. C. Todd's 'Birds of Western Pennsylvania.' He was a member of the Blair County Game, Fish and Forestry Club, and took an active part in stocking streams and game preserves. He was on the Court of Honor of the Boy Scouts, organized the Blair County Alpine Club, and was one of its most active members throughout his life. McGraw was also a student of local history and one of the foremost historians of Blair County. As the great grandson of Uriah Jones, author of the 'History of Blair County,' published in 1856, it was natural that history proved to be more than a hobby in his work. He served twice as president of the Blair County Historical Society and was Secretary-Treasurer of the organization at the time of his death.—T. S. PALMER.

FRANKLIN HERBERT MOSHER, an Associate of the American Ornithologists' Union, elected in 1905, died at Melrose Highlands, Massachusetts, on April 18, 1925, at the age of nearly 64. He was born in Dartmouth, Mass., September 8, 1861, and was an assistant entomologist in the Melrose Highlands Branch of the U. S. Bureau of Entomology. He was the author of a publication on the 'Food Plants of the Gypsy Moth in America,' which appeared in 1915 as U. S. Department of Agriculture Bulletin No. 250; with G. E. Clements 'Some Timely Suggestions for Owners of Wood Lots in New England,' in 1917; and with John E. E. Holbrook a 'Device for Inflating Larvae' in the 'Journal of Economic Entomology,' in June 1924.—T. S. PALMER.

JULIETTE AMELIA OWEN, an Associate of the American Ornithologists' Union for nearly 46 years, died in St. Joseph, Missouri, on October 25, 1943. She was born in St. Joseph on November 3, 1859. Ill health compelled her to leave Vassar College before graduation. Possessing skill as an artist, she illustrated books on folklore and geology written by her sisters. She also furnished data annually to various ornithological organizations but did not publish any papers on birds.

She was elected an Associate of the Union in 1897 and had expected to attend the annual meeting in Philadelphia in 1899, but finding it impossible to do so, sent the sum of $100, approximately the cost of the trip, as a contribution to the Union (Auk, 17: 59, 1900). By order of the Council, this money was made the nucleus of a "Research Fund," the income to remain intact until the fund amounted to $5,000 and then to be used for original research. Although this goal has not yet been attained, Miss Owen has made possible important investigations in the future.—T. S. PALMER and A. W. SCHORGER.

ADDISON PRENTISS WILBUR, an Associate of the American Ornithologists' Union, elected in 1895, died in Canandaigua, New York, on August 25, 1949, at the age of 81. He was born in New Brunswick, New Jersey, on June 9, 1868. For more than 25 years he was superintendent of Sonnenberg, the summer home of Mrs. F. F. Thompson, now the site of the Veterans' Hospital in Canandaigua, and he also managed the extensive Thompson estate in South Carolina, where he spent his winters. For some years Mr. Wilbur was associated with Elon Howard Eaton in the preparation and publication of Eaton's 'Birds of New York.'—T. S. PALMER.

FRANK SMITH WRIGHT, an Associate of the American Ornithologists' Union, died in Auburn, New York, December 9, 1938, at the age of nearly 81. He was born in Massachusetts, February 23, 1858, but at an early age moved to Auburn which was his home for nearly 75 years. He graduated from the Auburn High School and studied in the offices of local attorneys before being admitted to the bar. He conducted a general practice but specialized in cases before the Surrogate Court. He was one of the oldest members of the Cayuga County Bar Association and for a number of years served as U. S. Commissioner.

Mr. Wright was much interested in birds and had a large collection of mounted specimens. He was elected an associate of the Union in 1917 and maintained his membership until his death.—T. S. PALMER.

DR. ARTHUR A. ALLEN was the first Professor of Ornithology in a North American University, and Cornell is justly proud of his achievements. Over 10,000 students have learned about birds from him; his books and lectures, and color photographs of birds are outstanding in beauty and technical perfection. Dr. Allen is a long-time contributor to National Geographic Magazine, a contributing editor of Audubon Magazine, and Audubon Screen Tour lecturer. His newest book is "STALKING BIRDS WITH A COLOR CAMERA."

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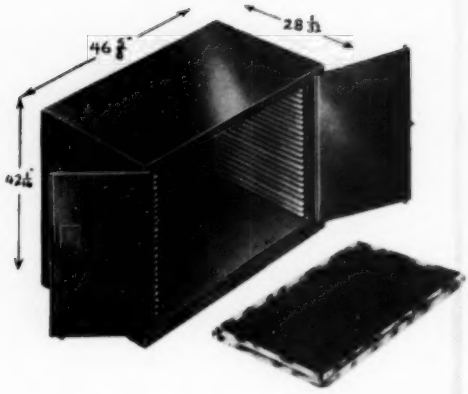

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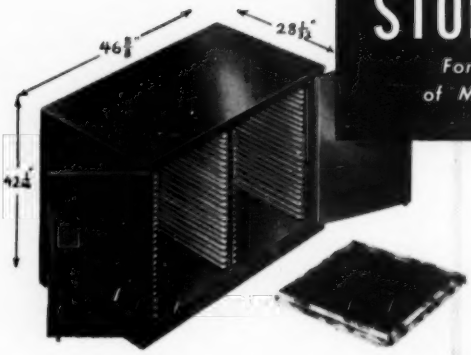

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